Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise

FINAL

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Animal and Plant Health Inspection Service,
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EXECUTIVE SUMMARY

The United Sates Fish and Wildlife Service (USFWS) and several cooperating agencies are proposing to implement a plan to reduce predation by the common raven (*Corvus corax*) on the federally threatened desert tortoise (*Gopherus agassizii*) in the California desert. During the past few decades, the population of the common raven has increased substantially in the California desert, primarily in response to human-provided subsidies of food, water, and nest sites. The common raven is a known predator of the desert tortoise. There is documentation of numerous carcasses of hatchling and juvenile desert tortoises under the nests of common ravens and a reduction in the proportion of hatchling and juvenile desert tortoises in the population at several locations in the California desert. The Desert Tortoise (Mojave population) Recovery Plan identifies reducing predation on the desert tortoise as a recovery task.

The agencies have developed six alternatives:

1. Alternative A or Current Program;

2. Alternative B–Integrated Predator Management Emphasizing Cultural and Physical Methods;

3. Alternative C–Integrated Predator Management and Removal of Ravens from Desert Tortoise Management Areas;

4. Alternative D–Integrated Predator Management and Removal of Ravens from Desert Tortoise Management Areas and Raven Concentration Areas;

5. Alternative E–Integrated Predator Management using only Nonlethal Cultural and Physical Methods; and

6. Alternative F-Integrated Predator Management using a Phased Approach of Alternatives B, C, and D.

These alternatives were developed to provide the full range of possible levels to reduce predation, from no new programs beyond existing management, to new programs using nonlethal methods, to new programs using nonlethal and lethal methods in various locations in the California desert.

The Alternative A describes the current level of management–limited nonlethal management actions being implemented at a few locations and no lethal control of common ravens. Alternative B focuses on reducing human subsidies of food, water, and nest sites to the common raven in the California desert. It provides immediate protection to hatchling and juvenile desert tortoises by identifying and removing ravens that have preyed or attempted to prey on the desert tortoise. Alternative C includes reduction of human subsidies to common ravens and removal of all ravens in specific areas (e.g., Desert Wildlife Management Areas, critical habitat, and specially designated management areas). No evidence of predation on the desert tortoise would be needed to remove ravens. Alternative D would incorporate raven removal in the areas identified in Alternative C and raven concentration areas, such as landfills. Alternative E would use nonlethal methods to reduce human subsidies of food, water, nest sites, and roost sites for the common raven thereby eventually reducing the size of the common raven population. Alternative F would implement Alternative B followed by Alternatives C and D if each of the previous alternatives were unsuccessful. Removal

methods for Alternatives B, C, D, and F include trapping, use of toxicants, and shooting. Depending on the location of the lethal removal, the most appropriate and humane method would be used.

In addition, several alternatives were identified, but eliminated because they are not feasible or would not achieve the purpose of reducing predation by the common raven on the desert tortoise.

The issues identified for analysis included impacts on: target species (common raven), nontarget species (desert tortoise and other wildlife species), socioeconomics, recreation, and human health and safety. The issues that were not analyzed were identified and included in a discussion on why their analysis was not appropriate.

These issues were evaluated for each of the six alternatives. Impacts on the common raven were analyzed so that a potential worst-case scenario is presented for the number of ravens that may be removed annually. For the foreseeable future, the actual impact would probably be much lower than what is estimated in this Environmental Assessment (EA). In addition, with a substantial reduction in human-provided subsidies, the common raven population should start to decline after a few years. The alternatives range from reducing the raven population in the California desert by 2.4 percent (Alternative B) to 18.7 percent (Alternatives D and F). Alternatives B, C, D, E, and F should benefit the desert tortoise and other species of wildlife upon which the common raven preys, but the extent and immediacy of this benefit would vary for these alternatives. With respect to the impacts on the issues, none of the alternatives evaluated rise to the level of significance.

Regarding cumulative impacts, we are unaware of any past, current, or planned future actions that would directly or indirectly impact the common raven with the exception of those proposed in this environmental assessment and a past effort by the Bureau of Land Management (BLM). Past actions to reduce predation by the common raven in the California desert are provided; however, BLM terminated this effort around 1994. Currently there is no organized program being implemented to reduce the number of common ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Since many of the common ravens in the California desert are resident birds, these removal efforts elsewhere should have little effect on the raven population in the California desert. Future actions that may indirectly impact the common raven would be continued human development throughout various locations in the California desert. These actions would benefit the common raven and would likely contribute to increased population numbers. However, these actions are detrimental to the desert tortoise and other species of wildlife in the California desert.

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1.0 INTRODUCTION

The United States Fish and Wildlife Service's (USFWS's) major responsibilities are to manage the Nation's public resources, which include endangered and threatened species, migratory birds, and anadramous fishes (fish that breed in freshwater but spend their adult life in saltwater). Through the Endangered Species Act of 1973 (ESA), as amended, Congress directed the USFWS as the lead federal agency that works with other federal, state and local agencies, and private citizens to recover and conserve species listed under the ESA so they may be removed from the list. The purpose of the ESA is to provide a means whereby, the ecosystems upon which endangered and threatened species depend may be conserved. The USFWS's goal is to ensure that listed species, and the ecosystems upon which they depend, are properly managed and conserved so the species no longer require protections of the ESA.

The USFWS is the lead agency that administers the Migratory Bird Treaty Act of 1918 (MBTA), as amended. The MBTA provides the USFWS with regulatory authority to protect bird species that migrate to or from the United States. This law prohibits the "take" of these species by any entity, unless permitted by the USFWS; USFWS can issue permits to take migratory birds that are causing damage to resources.

In the California desert, the USFWS works with federal, state, and local agencies to plan and implement activities that would contribute to the recovery and conservation of several listed species including the federally threatened desert tortoise (*Gopherus agassizii*). The desert tortoise occurs on federal, state, and privately-owned land in various locations in the California desert; it continues to decline in numbers from various factors which include predation by the common raven (*Corvus corax*).

The USFWS is also the lead agency and decision maker for this Environmental Assessment (EA), and is responsible for its scope, content, and outcome. Successful implementation of the recovery program for the desert tortoise in the California desert requires cooperation among numerous federal, state, and local agencies and the public. Any program to reduce raven predation on the desert tortoise requires the cooperation of the agencies with management authority for those lands. As part of this partnership recovery effort, this EA has been prepared with the cooperation of the U.S. Department of the Interior (DOI) USFWS, Bureau of Land Management (BLM), and National Park Service (NPS); U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS); Department of Defense (DOD), Department of the Army, Department of the Navy, the U.S. Marine Corps, and Department of the Air Force. This EA identifies and analyzes the potential environmental impacts related to the proposed action to reduce raven predation on hatchling and juvenile desert tortoises, with the goal of increasing hatchling and juvenile desert tortoise survivorship and recruitment into the adult population. Achieving this goal would bring us closer to recovering the desert tortoise. Many of the activities described in the alternatives to reduce human-provided subsidies of food, water, nest sites, and communal roost sites for the common raven have been initiated on lands administered by these agencies in the California desert. Other efforts to improve desert tortoise survival and recruitment are outside of the scope of this analysis.

This EA considers 16 alternatives in addition to the Current Action Alternative. It also describes alternatives that were considered but dismissed. The USFWS and its cooperating agencies are considering various management actions to increase desert tortoise survivorship by removing human-provided subsidies of food, water, and nest sites that attract and support elevated population numbers of ravens in the California desert. We are also considering removing individual ravens known to prey on desert tortoises, removing ravens from Desert Tortoise Management Areas (DTMAS) (e.g., desert tortoise critical habitat, Desert Wildlife Management Areas (DWMAs), research and other special management areas), and raven concentration areas (e.g., landfills).

Reducing common raven predation on the desert tortoise is one component of a multifaceted effort to aid in the recovery of this species. Other recovery tasks include acquiring, protecting, and restoring habitat; reducing mortality from other human activities; disease management; head starting; translocation; research; monitoring; and education and outreach (USFWS 1994, Tracy et al. 2004). Inherent in all of these activities is human education and outreach. Reducing common raven predation on the desert tortoise may require obtaining a permit to remove common ravens under the Migratory Bird Treaty Act.

1.1 Background

For more than two decades, researchers have documented population declines throughout much of the range of the desert tortoise in California, with some populations showing dramatic declines (Berry 1990, Corn 1994, USFWS 1994, Tracy et al. 2004). Because of these drops, in 1989, the USFWS listed the Mojave population of the desert tortoise as endangered under emergency provisions of the ESA. In 1990, the USFWS published a final rule listing the desert tortoise as threatened, because of sharp population declines that were documented throughout its range (55 Federal Register 12178–12191). The decline of the Mojave population of the desert tortoise is attributed to direct and indirect human-caused mortality including destruction, degradation, fragmentation of habitat, and loss of individual desert tortoises from human contact, predation, and disease. The desert tortoise is also listed as threatened under the California ESA.

The USFWS published a Recovery Plan for the Mojave population of the desert tortoise in 1994. The Recovery Plan identified six recovery units and one or more Desert Wildlife Management Areas (DWMAs) within each recovery unit. The DWMAs are the primary focus areas to promote the recovery and long-term persistence of viable desert tortoise populations (Figure 1-1). The Recovery Plan includes predation as one of the important factors in the decline of the Mojave population of the desert tortoise that must be reduced. This includes predation of adult and subadult desert tortoises by free-roaming and feral dogs and intense predation of hatchling and juvenile desert tortoises by an escalating population of common ravens (Figure 1-2).

Since listed as threatened in 1990, desert tortoise populations in the west Mojave, northeast and east Mojave, and north and east Colorado-desert areas have shown downward trends. These population declines are of particular concern in the west Mojave Desert. The desert tortoise in the west Mojave recovery unit has experienced substantial population decline which are due, to loss of habitat and other threats (Tracy et al. 2004).

Figure 1-1. Hatchling desert tortoise at Edwards Air Force Base. (Photo by Mark Bratton)

Figure 1-2. Juvenile desert tortoise shell with classic puncture marks from a common raven's beak.

Populations of the desert tortoise cannot increase and recover unless the number of young desert tortoises that are recruited into the breeding population (e.g., allowed to survive, reach adulthood, and reproduce) is greater than the number of adults that die (Congdon et al. 1993, USFWS 1994). Several researchers and field biologists have reported occurrences of numerous carcasses of hatchling and juvenile desert tortoises beneath raven nests and perch sites (Berry 1985, BLM 1990a, Campbell 1983, Farrell 1991). Campbell (1983) found 136 dead bodies or carcasses of juvenile desert tortoises with evidence of raven predation at the base of fenceposts on the perimeter of the Desert Tortoise Natural Area. Within a 4-year period, 250 juvenile desert tortoise carcasses were located beneath one raven nest in the west Mojave Desert (Woodman and Juarez 1988). Berry et al. (1986) reported that 29 and 44 percent, respectively, of the desert tortoise deaths or mortality at two study plots during a 6-year period, were probably caused by raven predation. At another location, 70 percent of the mortality to juvenile desert tortoises was attributed to raven predation (Berry et al. 1986). Ravens have also been observed attacking and eating juvenile desert tortoises (Berry 1985, Boarman 1993). Ravens eat hatchling and juvenile desert tortoises by pulling off the head and limbs (40 percent) or pecking holes through the soft carapace (upper half of the shell) (46 percent) or plastron (lower half of the shell) (13 percent; n = 341) (Boarman and Heinrich 1999). Boarman and Hamilton (personal communication) obtained 266 desert tortoise shells collected beneath common raven nests. These carcasses showed patterns of shell damage that were consistent with raven predation. Ravens are able to catch, carry while flying, and eat juvenile and hatchling desert tortoises because of their small size and weight, the lack of ossification or hard bone material in their shells, and the corresponding high-activity periods of both desert tortoises and nesting ravens in the spring. In the open desert in California,

89 percent of ravens observed foraging were eating wild animals in the spring versus 5 percent in fall (McKernan 1992a, McKernan 1992b). This level of predation may prevent recruitment in declining populations (Congdon et al. 1993) such as the desert tortoise.

Populations of the common raven have increased in the California desert in the last several decades. Johnson et al. (1948) reported common ravens as not common in the east Mojave Desert of San Bernardino County in the 1930s. They were not seen in the winter and spring. They were observed in the summer at lower elevations and flying along a railroad track, and near Kelso and Purdy, locations of human development. This information suggests that in the 1930s, common ravens were migratory, not common, and did not overwinter or breed in the desert.

From 1969 to 2004 the numbers of common ravens in the west Mojave Desert increased approximately 700 percent (Boarman and Kristan 2006). Population increases have also been noted at other locations in the California desert. This many-fold increase above historic levels and a shift from a migratory species to a resident species is due in a large part to recent human subsidies of food, water, and nest sites (Knight et al. 1993, Boarman 1993, Boarman and Berry 1995). Table 1-1 presents the rate of increase in survey results for common ravens, golden eagles (*Aquila chrysaetos*), greater roadrunners (*Geococcyx californianus*), and red-tailed hawks (*Buteo jamaecensiis*) in the California desert. From 1966 to 2006, the number of common ravens observed during surveys increased 1,685-fold while golden eagles, greater roadrunners, and red-tailed hawks increased 5-, 13-, and 57-fold, respectively. Raven population numbers have increased at a rate that is disproportionately greater than other predatory birds in the California desert.

Table 1-1. Summary of Results from Christmas Bird Count Surveys in the California Desert for Four Potential Avian Predators of the Desert Tortoise

	Number of Observations			
Years	**Common Raven**	**Golden Eagle**	**Greater Roadrunner**	**Red-Tailed Hawk**
1961-1965	1	0	5	1
1966-1970	3	3	4	6
1971-1975	174	4	7	21
1976-1980	619	15	24	68
1981-1985	749	39	56	180
1986-1990	1,018	31	52	179
1991-1995	2,591	19	64	210
1996-2000	3,930	25	37	329
2001-2006	5,056	15	65	344

At these elevated population levels, common raven predation on desert tortoise hatchlings and juveniles has shifted the composition of the desert tortoise population to predominantly adult desert tortoises by removing a substantial proportion of hatchling and juvenile desert tortoises in some areas, and has adversely affected recruitment (Berry et al. 1986). Without recruitment of hatchling and juvenile desert tortoises to the next generation of adult desert tortoises in the population, the old adults will eventually die and the population will become extinct. For example, at one location, the percentage of adults in the desert tortoise population increased from

54 to 82 percent from 1979 to 1988, while the percentage of juvenile desert tortoises in the population declined from 27 to 12 percent.

The declines in juvenile desert tortoises were attributed to raven predation (Berry, Woodman, and Knowles 1989). This trend in increased proportion of adults and decreased proportion of juvenile desert tortoises also occurred at other sites (Berry et al. 1990). Ray et al. (1992) developed a simple model of population growth for the desert tortoise. While it contained several assumptions, it demonstrated that the population growth rate of a healthy desert tortoise population could be changed to a declining rate by decreasing the survival rate of hatchling and juvenile desert tortoises by about 25 percent. The decline in juvenile desert tortoises from 27 to 12 percent is a decrease in the survival rate of more than 50 percent. If this declining trend is not reversed soon, these populations of the desert tortoise would eventually be exterminated.

Some of the California desert does not provide suitable habitat for common ravens to survive and reproduce. For example, ravens need a high location to construct a nest (e.g., tree, utility pole, abandoned vehicle, freeway sign, or cliff), and adequate food and water within their nesting territory (Appendix A). Common ravens actively defend their nest territory during the breeding season. In 2004 and 2005, McIntyre (2006) conducted surveys of common raven nests in part of the California desert. The purpose of the surveys was to determine locations of raven nests and collect data on the number of nests with desert tortoise remains under them. In 2004 and 2005, 28 and 27 nests, respectively, were located with desert tortoise remains beneath them.

1.2 Purpose and Need

The purpose and need of this EA is to present and analyze a proposed action to reduce common raven predation on hatchling and juvenile desert tortoises in the California desert by modifying land management practices and selective removal (see Figure 1). The USFWS believes that reducing this predation is needed to increase desert tortoise survivorship. This position is based on the best information currently available (Boarman 2002, Congdon et al. 1993, USFWS 1994). Increased survivorship of juvenile and hatchling desert tortoises into the reproductively active adult population is expected to contribute to the recovery of the species.

1.2.1 Level of Reduction Needed

Common raven pairs establish a home range in which they forage and nest. The entire home range is not defended from other common ravens. However, within this home range, they establish a breeding territory which they actively defend from other ravens, especially during the breeding season (Boarman and Heinrich 1999). The common raven breeds in spring in the California desert. A pair of common ravens constructs a nest and actively defends a territory around this nest. During this breeding period, most of their hunting activity is confined to this territory. Thus, this area is intensively hunted in the spring, which also corresponds to the time when desert tortoise activity is greatest, and the need for food for breeding ravens and their offspring is greatest. In a successfully defended breeding territory, only the common raven breeding adults pose a risk of predation to the desert tortoise with the risk increasing closer to the nest (Kristan and Boarman 2003). Common ravens are accomplished hunters, but not all common ravens hunt and eat desert tortoises (Boarman and Hamilton in prep).

The feeding behavior of nonbreeding common ravens is different from that for breeding adults. Large numbers or crowds of nonbreeding common ravens are attracted to concentrated human-subsidized sources of food, water, and roost sites. In general, these nonbreeding ravens are spatially restricted in the California desert, whereas, breeding common ravens are more evenly distributed throughout the California desert area (Kristan and Boarman 2003). These common raven crowds feed at concentrated food sources (e.g., landfills and illegal dumps) (Chamblin and Boarman 2004) and are frequently reported in the California desert (Boarman and Heinrich 1999). They have also been observed moving between concentrated food source sites. Nonbreeding ravens are gregarious and use other nonbreeding raven as cues of food availability (Kristan and Boarman 2003). Fledgling chicks move to human-subsidized resources that have crowds of common ravens.

Kristan and Boarman (2003) investigated the spatial pattern of risk of common raven predation on the desert tortoise in the Mojave Desert of California. They learned that the risk of raven predation to hatchling and juvenile desert tortoises was high near places attracting large numbers of nonbreeding ravens such as landfills. Where the common raven's human-subsidized habitat is intermixed with the desert tortoise's habitat, the risk of predation by the common raven on the desert tortoise increases and can exterminate the desert tortoise (Kristan and Boarman 2003). Many sources of human-subsidized habitat that support crowds of common ravens are located within or adjacent to human development. Desert tortoise predation from these raven crowds is termed "spillover" predation. For example, the predation by a crowd of common ravens at a landfill spills over from the landfill to any nearby desert tortoise habitat, thus increasing the risk of predation on the desert tortoise occupying this nearby habitat. In certain locations, these crowds of common ravens may represent a threat to the hatchling and juvenile desert tortoise populations at localized sites in the California desert, where these sites are adjacent to desert tortoise habitat.

From the available information, the greatest risk of predation to hatchling and juvenile desert tortoises from the common raven appears to be from breeding common ravens within their territories and from spillover predation from crowds of nonbreeding common ravens. The spillover predation risk appears to be localized and can likely be effectively managed by reducing human subsidies of food, water, and roost sites. The predation risk from breeding common ravens occurs throughout the California desert and does not appear to be substantially limited by food availability.

To determine the number of common ravens that would need to be reduced to effectively manage the predation risk from breeding common ravens, we used the data from McIntyre (2006) on the number of nests or raven pairs preying on desert tortoises from part of the California desert. We also used the information on the reproductive needs and behavior of the common raven (Appendix A). McIntyre's data showed that about 28 common raven nests in 2004, and again in 2005, had desert tortoise remains beneath these nests. We applied or extrapolated McIntyre's information to the range of the desert tortoise throughout the California desert. The result was that approximately 100 nests or pairs of common ravens would have desert tortoise remains under their nests in a given year. Therefore, if 100 pairs of common ravens that prey annually on hatchling and juvenile desert tortoises were removed, this action would eliminate most of the predation on juvenile and hatchling desert tortoises by breeding common ravens in the California desert. Common raven predation on the desert tortoise is

primarily a learned behavior. Ravens can learn to hunt for and kill desert tortoises from other ravens or, through trial and error, learn themselves. Because predation on the desert tortoise is a learned behavior, not all common ravens prey on desert tortoises. If other common ravens replace those removed, they may never learn to prey on the desert tortoise. If they do learn, there would likely be a period of time when they do not prey on desert tortoises. This predation reduction should provide immediate relief to the adult-dominated and senescent desert tortoise populations in the California desert by increasing the number of hatchling and juvenile desert tortoises in the populations and increasing the total number of desert tortoises in the populations.

1.2.2 Decisions to Be Made

The USFWS is the lead agency for the proposed action. The USFWS and the cooperating agencies will address the following questions using an interdisciplinary analysis in this EA.

a. What is the method of selected common raven management that will most effectively contribute to desert tortoise recovery in the California desert?

b. What are the environmental effects of implementing the various alternatives?

1.3 Issues and Concerns

The following listed issues were identified using federal laws, regulations, executive orders, agency management policies, and our knowledge of limited or easily impacted resources. The USFWS and the cooperating agencies determined, through interagency consultation, past planning efforts, coordination with environmental groups, input from state agencies, and initial public involvement, that the following issues should be considered in the decision making process for this EA to help compare the impacts of the alternative management strategies. Following is a brief discussion of why certain issues were selected for further analysis and why others were dismissed from further consideration:

a. Impact on the Common Raven–The National Environmental Policy Act (NEPA) calls for an examination of the impacts on all components of the human environment. The BLM, NPS, and DOD policy is to protect the natural abundance and diversity of natural communities. Since all alternatives would involve manipulation of wildlife resources, specifically the common raven, and there are concerns for impacts to nontarget species, impacts on target species are addressed as an impact topic in this document. What effect would the alternatives have on the common raven? How would management strategies affect local or regional populations of the common raven?

b. Impact on Nontarget Species–The ESA requires an examination of effects to all federally listed threatened or endangered species. This section will address all federal and state threatened and/or endangered species. The desert tortoise is a federal and California state-listed species. Therefore, federal and state listed species are addressed as an impact topic in this document.

Since the alternatives would involve manipulation of wildlife resources, and there are concerns for impacts on nontarget species, the impacts on nontarget species will be addressed in this document.

c. Socioeconomic Issues–What effect might the alternatives have on increasing or decreasing the amount of money that would be spent in the area thereby, adding to or subtracting from the economy in the California desert? What effect might the alternatives have on the lifestyle of the residents and businesses in the California desert?

d. Recreation–How might the alternatives affect recreation opportunities and experiences in the California desert?

e. Human Health and Safety–During the scoping period, the public identified concerns for human health and safety regarding some of the raven management actions that are considered in this document. Therefore, human health and safety are addressed in this document. What effect might the alternatives have on human health and safety if the public is at or near locations where lethal methods would be used to remove common ravens?

1.4 Issues Not Discussed with Rationale

a. Impacts on Biodiversity and Ecosystems–If the USDA's APHIS-WS uses lethal methods to remove the common raven, their activities would be confined to removing specific offending individuals or a species at specific locations. They would not remove common ravens to significantly reduce or eradicate the population as a whole. The APHIS-WS operates according to international, federal, and state laws and regulations, which were enacted to ensure species diversity and viability. The APHIS-WS has determined that the impacts of their program on biodiversity from predator management would not have a significant effect nationwide, statewide, or in the analysis area (USDA 1997, revised). The number of ravens that may be removed ranges from a very small to moderate percentage of the total population as analyzed in Section 4.0 of this report.

b. Impact on Minority or Low-Income Persons or Populations (Environmental Justice [EJ] and Executive Order 12898)–All of the activities implemented by the USFWS and federal cooperating agencies are evaluated for their impacts on the human environment and compliance with EO 12898 to ensure EJ. There are no minority or low income populations within the proposed action area on federal land. On nonfederal land, the proposed action is expected to be implemented throughout the California desert or substantial areas of the California desert. Since the proposed management methods would not pose a disproportional risk to low income persons or their environment and does not locate any facilities or contain any ground disturbing activities, we do not anticipate that any of the alternatives would result in any adverse or disproportionate environmental impacts to persons of any race, income, or culture.

c. Protection of Children from Environmental Health and Safety Risks (EO 13045)–Because the USFWS has determined that identifying and assessing environmental health and safety risks is a high priority, the USFWS has considered impacts that the alternatives analyzed in this EA might have on children. Reducing predation by common ravens on the desert tortoise, as proposed in this EA, would only involve legally available and approved management methods in situations or under circumstances where it is highly unlikely that children would have the potential for exposure. Some actions, such as properly containing and disposing of trash and reducing water sources for disease-bearing mosquitoes, would improve human health and safety for children and adults. Therefore, implementation of any of the alternatives is highly unlikely, and not reasonably foreseeable, to pose an environmental health or safety risks to children.

d. Impact on Cultural Resources–The Mojave and Colorado deserts have been occupied by humans for at least 11,000 years. The historical record shows that the region of the Mojave Desert of interest to this project was inhabited and/or used by the Owens Valley Paiute, Timbisha Shoshone, Chemehuevi, Serrano, Mojave, and Cahuilla.

During federal interagency consultations, agencies noted that some tribes may have concerns about the lethal or nonlethal removal of common ravens. Ravens may be important to their cultural and religious heritage.

We contacted tribal offices and cultural committees in the action area in 2004 and invited their comments and concerns about this issue. The Bureau of Indian Affairs initiated outreach to tribal offices and cultural committees in August 2005. One tribe indicated that they would like to receive future documents associated with this project (Appendix B).

Removal of common ravens on tribal lands is not proposed and no ground disturbing activities are planned in any of the alternatives in this EA. The actions that are proposed to reduce human subsidies to the raven do not have the potential to affect objects, sites, or properties that are listed on or eligible for listing on the National Register of Historic Places (NRHP). Therefore, impacts to cultural resources are dismissed from further consideration.

e. Impact on Wilderness–The actions proposed in the alternatives could be implemented within designated, proposed, or potential wilderness areas, but this is not proposed or expected to occur. If any of the actions are implemented in wilderness areas, the land management agency for that area would first prepare a Minimum Tool Analysis, as required by the *Wilderness Act of 1964*. Wilderness should not contain human-subsidized sources of food, water, and nest/ roost sites for common ravens. Because federal action to reduce raven predation on the desert tortoise is unlikely in wilderness areas and because any action proposed for implementation in a wilderness area would require additional evaluation through the Minimum Tool Analysis, wilderness impacts are dismissed from further consideration.

f. Impact on Noise–Hunting and shooting are allowed on BLM land and hunting is allowed on the Mojave National Preserve. Discharge of firearms also occurs on military lands. The increase in the level of use of firearms from shooting the common raven would result in a negligible increase in the hunting and shooting that is already allowed in these areas. Noise suppressors in key areas are included in the alternatives and could be used to minimize noise impacts.

g. Other Resources–The actions discussed in this EA involve minimal ground disturbance, no new construction, minimal use of vehicles and equipment, and use of existing roads. Therefore, the following resource values should not be affected by any of the alternatives analyzed: air quality, soils, geology, minerals, water quality, water quantity, floodplains, wetlands, aquatic resources, prime and unique farmlands, park lands, vegetation, ecologically critical areas, traffic, visual quality, energy requirements and conservation, natural or depletable resources, urban quality, unique ecosystems, geological resources (rocks and streambeds), stream-flow characteristics, seismicity, and sacred sites and Indian Trust resources at our proposed sites. There are no wild and scenic rivers in or adjacent to the project area. Each of these topics was analyzed as it relates to the potential alternatives. Each was dismissed because of lack of relevance and/or lack of impact from the proposed alternatives.

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2.0 AFFECTED ENVIRONMENT

2.1 Background–California Desert

The California desert includes the Mojave and Colorado deserts within California. It extends north to the Nevada State Line and Highway 168 junction and continues south to the United States-Mexican border. The California-Nevada and California-Arizona State Lines define its eastern boundary. The following mountain ranges primarily define its western boundary: eastern and southern Sierra Nevada, eastern end of the Tehachapi Mountains, San Bernardino and San Gabriel Mountains, and Mount San Jacinto to the Peninsular Ranges. The California desert occupies more than 30 million acres and covers portions of Imperial, Inyo, Kern, Los Angeles, Riverside, San Bernardino, and San Diego counties.

2.2 Climate

Hot summer temperatures (average daily highs above 100 degrees Fahrenheit) and low annual precipitation (approximately 5 inches or less) characterize the California desert. Precipitation in the form of snow can occur during the winter at higher elevations. Probably more important than the averages is the extreme variability in the weather. Daily temperature variations of 40 degrees can occur. Precipitation extremes are also common; variations of 80 percent in annual precipitation can occur. Summer thunderstorms can drop more precipitation on a site in one event than the mean precipitation for that location for the year. High winds can occur; peak-wind velocities above 50 mph are not uncommon.

During the summer, the west side of the Mojave Desert is heavily influenced by the dry southwest airflows resulting in typically very dry weather. The influence of southwest winds diminishes toward the eastern Mojave Desert. This results in a more continental influence and its resulting monsoonal weather patterns. Thus the western section of the California deserts predominately have winter rains and the eastern sections, which receive winter rainfall, receive more of their annual rainfall with the summer thunderstorms. Both east and west sections of the California deserts can receive rain in both periods.

Extreme variability is another characteristic of the precipitation. Some locations such as the town of Mojave have a mean precipitation of 6.06 inches and a standard deviation of 4.04 inches. This means that the normal precipitation ranges from a low of 2.02 inches to 10.10 inches. This is an 80 percent variation in precipitation.

2.3 Biological Environment

The California desert has a distinct flora and fauna that have adapted to the local conditions and formed distinct natural communities, including species found nowhere else (e.g., endemics). It also incorporates the ecotones or transitional communities from the Sierra Nevada, Tehachapi, San Gabriel, and San Bernardino Mountains. The predominant aspect of the California desert is a flat, sparsely vegetated region interspersed with mountain ranges and dry lakes. Elevational changes range from more than 10,000 feet to below sea level. The Mojave Desert is a part of the high desert, large portions of which lie at elevations between 2,500 and 4,000 feet. The low desert or Colorado Desert occurs at elevations from below sea level to 2,500 feet. Wildflowers cover the characteristic creosote bush and saltbush plant communities of these two deserts in

years of above-normal winter rainfall, and up to 90 percent of the floral diversity is composed of annual plants.

The BLM Desert Plan staff inventoried the California Desert Conservation Area (CDCA) for its flora and fauna in the late 1970s (BLM 2005). They recorded 1,836 vascular plant species in 116 families and 635 species of vertebrate animals. This diversity reflects the varied topography, soils, and landforms within the planning area. For example, the western Mojave Desert contains thirty-two distinct plant communities. The most common communities are creosote bush and saltbush scrubs, which occupy 75 percent of the natural lands. Mojave mixed woody scrub accounts for 13 percent of the native vegetation. The remaining 29 plant communities are found in isolated areas with unique conditions, such as freshwater or alkali wetlands, or occur along the south and west edges of the desert-mountain transition.

Inventories of invertebrates, such as insects, mollusks, and fairy shrimp have been completed for only a few groups, but show a high level of endemism and specialization to unique substrates, host plants, and water sources. Thousands of additional invertebrate species are present (BLM 2005).

The region contains at least four endemic vertebrate animals and thirteen endemic plants. A number of disjunct localities exist where plants and animals range into the planning area far from their primary distribution. Many of the rare species are concentrated at special sites, where unique substrates, water sources, or topography is present. Several areas have high biodiversity because of location at the desert-mountain transition zone or ecotone.

A large number of introduced plant species and a small number of introduced animal species (excluding insects) are found in the California desert. A few of these animal species have substantial effects locally on the native environment, particularly feral burros and bullfrogs. They provide a new level of pressure or threat to the native species. In addition, feral and free roaming dogs are a problem in several areas because of added predation on native species. The common raven is a natural predator of the desert tortoise. However, its population numbers have increased markedly in the last few decades, which have increased the level of predation on the desert tortoise (Boarman and Berry 1995, Boarman 2006).

The number of introduced invasive plant species is higher and in some respects more of a threat to the natural ecosystem. Riparian invasive plants include tamarisk (*Tamarix parviflora)*, Russian olive (*Elaeagnus angustifolia*), and common reed (*Phragmites australis*), which crowd out native willows and cottonwoods in riparian habitats. Weedy annuals such as storkbill, several species of brome grass, split grass (*Schismus barbatus)*, Sahara mustard (*Brassica tournefortii* Gouan) and other annual plant species compete with native wildflowers, provide a nutritionally deficient food plant for the desert tortoise (Oftedal et al. 2002), and have altered the fire regimen in the desert. They provide fuel to support and sustain large fires in the desert, which is not adapted to them (Brooks 1998).

3.0 PROPOSED ACTION AND ALTERNATIVES

3.1 Proposed Action

The proposed action is to reduce raven populations by integrating federal, state, and local management plans and developing a major public outreach and education program. The management techniques include cultural and mechanical methods (e.g., reduce human subsidies of food, water, nest sites, roosting sites for the common raven, and aggressive nest removal) with the potential of limited raven removal in designated areas. The alternatives analyzed in Section 4.0 use various combinations of methods to implement the proposed action. We expect this level of effort to include one USFWS administrator (part-time), a part-time identification field team, and potentially a small part-time removal team per year for the life of the project.

The proposed action would occur at various locations within desert tortoise habitat in the California desert and at areas with human development that are in and near desert tortoise habitat (e.g., communities, waste disposal sites, and agricultural areas). Three of the alternatives discussed include the removal of common ravens.

The Proposed Action also contains many safeguards to avoid and/or minimize the potential impacts of this action. These measures include:

a. Measures to Avoid or Minimize Impacts on Target Species Populations

1) California Department of Fish and Game (CDFG) has been consulted on state regulations and policies affecting the management of the common raven and the status of the common raven population in the California desert. Implementation of effectiveness monitoring will ensure that common ravens will be removed only when necessary to meet stated objectives.

2) Wildlife specialists would be used to capture and release or dispatch the common raven.

3) The impacts of the program on the common raven would be monitored annually.

4) The impacts of the program on the common raven would be monitored by considering the "cumulative take" which involves assessing the impacts of all known forms of take against the common raven population estimates and trend indicators.

5) Common ravens that are trapped would not be relocated. They would be euthanized using the most humane methods practicable and offered to museums or laboratories for research purposes.

b. Measures to Avoid or Minimize Impacts on Nontarget Species Including Federal and State Listed Threatened and Endangered Species

1) The CDFG has been consulted on state wildlife regulations and policies concerning the state-listed desert tortoise and Mohave ground squirrel. The CDFG concurred with our determination that take was unlikely to occur (see Section 3.1.a.1).

2) The CDFG has been consulted regarding potential risks to state listed threatened and endangered species.

3) The USFWS would be consulted regarding potential risks to federally listed-threatened and endangered species and species proposed for listing. All applicable measures

identified through the consultation/conference process to protect listed and proposed species would be implemented.

4) The impacts of the removal program on nontarget species would be monitored annually.

5) Bait used for the common raven would be as selective as possible for this species, while still maintaining effectiveness.

6) Personnel working to remove the common raven would be trained to identify federal and state endangered and threatened species that may be present and avoid them.

7) Carrion and meat baits would not be used at baiting platforms.

8) Vehicle speeds on nonpaved roads in desert tortoise habitat would be limited to 25 miles per hour (mph) for personnel accessing sites to remove common ravens.

c. Measures to Avoid or Minimize Impacts on Recreation

1) Suppressed firearms would be used in situations where noise from gunshot would have a negative impact on recreational use of the site.

2) Activities to remove common ravens would only be conducted after agreements, work plans, or other comparable documents are developed with the landowner/managing agency.

3) Work plans would consider activities in closely adjacent settlements and communities to minimize impacts on lifestyle or human communities on adjacent lands.

4) Activities to remove common ravens in areas known to receive extensive human use or close to human communities or settlements would be conducted at times and with methods which would minimize impacts on recreational activities.

d. Measures to Avoid or Minimize Impacts on Human Health and Safety

1) Activities to remove common ravens would only be conducted on private/public lands with the permission of the landowner/managing agency. Agreements, work plans, or other comparable documents would be prepared with the landowner/managing agency designating the times and methods.

2) Activities to remove the common raven would only be conducted after agreements, work plans, or other comparable documents are developed with the landowners, or adjacent communities are informed of the removal activities prior to implementation. No lethal methods would be used in areas with legal or policy restrictions that preclude the proposed activities.

3.2 Effectiveness Monitoring and Adaptive Management

A key component of integrated predator management is to monitor the effectiveness of the management action in meeting the stated objective. This is called effectiveness monitoring. If the action was effective, then it would continue. If it was not effective, then the action would be modified or adapted. This implementation of adaptive management includes monitoring to determine if the adaptive management is effective. Management actions might change or adapt, depending on the results of the monitoring to determine the effectiveness of these actions.

The existing Raven Management Interagency Task Group, established in late 2002, would coordinate implementation of the Proposed Action, evaluate monitoring reports, assess progress of the actions, and recommend changes in the program. This adaptive management/effectiveness monitoring program would include elements to determine if there is a change in predation by the common raven on the desert tortoise and a change in the raven population or distribution at a regional level within the California desert.

To determine change in raven predation on the desert tortoise at a local or site specific level, we propose to measure changes in the occurrence of desert tortoise remains found at raven nests, after removing specific pairs of nesting ravens (Boarman and Kristan 2006). Using data from the previous or current year on nest locations for common ravens, surveys would be conducted at nest sites for evidence of predation on the desert tortoise. The Proposed Action would be effective if the number or percent of nests surveyed, with evidence of predation and the number of desert tortoise carcasses found during surveys, are lower than the baseline or first year's data collected. Another possible approach to measure changes in predation pressure on desert tortoise populations at any location, would be to use an approach similar to Kristan and Boarman (2003), where models of juvenile desert tortoises are placed in the California desert and monitored to determine changes in the frequency of raven attacks (Boarman and Kristan 2006).

Common raven population trends would be monitored using road surveys both inside and outside the Desert Tortoise Management Areas (DTMAs). Trend analysis would also include the Christmas Bird Count (CBC) survey data and the Breeding Bird Survey (BBS) data. The road surveys would provide information on whether ravens use the DTMAs at the same level as unmanaged areas and could yield data for testing the effectiveness of specific actions or projects. The CBC and BBS data sets would provide the overall long-term trend of the raven population in the California desert.

The USFWS, in coordination with the cooperating agencies, would monitor the selected action through periodic reviews of the monitoring data as compared to the goal in the final NEPA document and decision. Data from the USFWS's range-wide monitoring program for the desert tortoise would be used to determine changes in the desert tortoise population regionally or range wide. The APHIS-WS would assist in the production of an annual report discussing the locations where work was conducted, the number of target and nontarget animals, if any, removed, and recommendations for subsequent season's work. The USFWS and cooperating agencies would review the results of the effectiveness monitoring including any recommendations for modifications, and use this information and information from APHIS-WS to determine if the impacts of the program are within the parameters analyzed in the EA, and if a new evaluation pursuant to the NEPA or Section 7 of the ESA is necessary.

3.3 Objectives of the Proposed Action

3.3.1 Objective 1

Reduce human-provided subsidies of food and water; and nest and communal roost sites for the common raven.

Many of the following activities listed would be implemented by state and local agencies and the public. Many would be implemented by the USFWS or any of the agencies previously listed. Since implementation of any of these activities may or may not be a federal action, we are listing all of the activities. From this set of activities, those that require analysis under NEPA are analyzed in Section 4.0, Environmental Consequences.

To implement the first objective, the following activities are proposed:

a. Develop and implement an outreach program–The USFWS and the agencies would develop and implement an outreach program. The outreach program would inform the public about the status of the desert tortoise, build support among the public to help the desert tortoise reverse its declining population numbers, and inform the public that they, as individuals, can help reduce mortality of the desert tortoise by making simple changes in their home, work, or recreational environment. The USFWS recognizes that the public plays a key role in reducing many of the unintentional human-provided subsidies, which have contributed to the raven's population explosion in the California desert in the last few decades and hopes that the public would implement the recommendations provided to them through the outreach program.

Before developing the outreach program, the USFWS and cooperating agencies would conduct a study that would gather baseline data on public attitudes, perceptions, and values about the desert tortoise and the raven, desert tortoise recovery efforts, and conservation of the California desert. The survey results would be used to help design effective public outreach messages and strategies. This outreach program would include developing and distributing written, audio, and video materials directly to residents of the California desert, visitors to the California desert, school children, decision makers, and stakeholders. A follow-up survey would be conducted to evaluate the effectiveness of the outreach program a few years after its full implementation.

b. Reduce or eliminate human-subsidized food and water for the common raven–We would coordinate with local waste management companies, and local, state, and federal agencies to reduce raven access to organic wastes and standing water at locations such as landfills and transfer stations. We would work with local, state, and federal agencies to clean up unauthorized dumps and develop incentives for the public to report unauthorized dumping, trash containment, or watering.

Working with local, state, and federal agencies, we would encourage an enhanced level of enforcement of existing regulations on trash management and water use. If needed, we would work with local agencies to develop and implement additional regulations to reduce human-provided subsidies of food and water to the common raven.

To better manage solid waste at its point of origin (e.g., businesses and homes), we would work closely with federal agencies to contain solid waste on federal lands and at federal facilities, and strongly encourage nonfederal agencies to do the same. Such efforts would include: using raven-proof trash bins at public (e.g., roadside rest stops, campsites), business (e.g., construction sites, restaurants and food manufacturers, gas stations, and grocery stores), and residential (e.g., apartments and houses) facilities; and reduce availability of livestock feed, carcasses, afterbirths, and insects at feedlots and dairy and poultry farms.

To better manage surface water use, we would implement the same approach with federal, state, and local agencies as for solid waste to minimize the availability of surface water, which

can be used by ravens. We would coordinate with agencies and appropriate businesses (e.g., water companies, well drilling companies) to promptly repair leaks in landscaping and irrigation systems, reduce over-watering and standing water as products of their operation, and encourage municipalities to reduce water features in their landscapes.

c. Reduce the availability of animal carcasses along roadways–We would continue to work with federal, state, and local road departments to install desert tortoise exclusion fencing and culverts along highways in desert tortoise habitat. These features would direct desert tortoises, and possibly other wildlife, to culverts to safely pass under roadways rather than attempting to cross the roadway where they might be struck by vehicles. We would also work with federal, state, and local highway departments to quickly remove animal carcasses from roadways to reduce food subsidies for common ravens.

d. Remove common raven nests not occupied with eggs or nestling–On federal lands and facilities, we would work with federal agencies to remove raven nests from human-created structures within the DTMAs and along a 2-mile perimeter around the DTMAs. For those ravens whose nests were removed during courtship but prior to egg-laying, we would attempt to trap, tag, and transmitter the ravens to determine whether they attempted to renest, and if so, where.

e. Remove or modify manmade communal roosting sites for ravens–For abandoned or nonfunctioning structures that are used as communal roost sites by common ravens, we would encourage federal and nonfederal entities to remove these unnecessary structures. For human-built structures that are not removed, we would encourage federal and nonfederal entities to modify the existing structures to reduce or eliminate roosting by common ravens. In addition, we would work with federal, state, and local agencies to minimize construction of new structures that are used by ravens for communal roosting (e.g., communication towers, billboards, and shade structures). As structures are designed and built, we would work with project proponents to design structures to minimize or prevent ravens from using them as communal roost sites.

f. Remove or modify human-provided nest sites for ravens–We would encourage federal and nonfederal entities to remove unnecessary structures inside and within 2 miles of any DTMA that are used as nest sites by the common raven. For structures that cannot be removed, we would encourage federal and nonfederal entities to modify existing structures to reduce or eliminate the likelihood of these structures being used as nest sites by ravens. In addition, we would work with federal, state, and local agencies to minimize construction of new structures (e.g., electrical towers, billboards, communication towers, open warehouses, or shade towers). As structures are designed and built, we would work with project proponents to design structures to minimize or prevent ravens from using them as nest sites.

3.3.2 Objective 2

Remove ravens that prey on the desert tortoise. This objective includes:

a. Identify ravens that have preyed on the desert tortoise–Evidence of predation would be locating a minimum of one desert tortoise shell showing the classic peck marks of raven predation within 1 mile of a nest (Boarman 2002b). Direct observation of a common raven

preying or attempting to prey on a desert tortoise would also be evidence of predation. All raven pairs documented as desert tortoise predators would be removed.

b. Remove predatory ravens–Common ravens would be removed using the most appropriate humane and safe method. Removal methods could include shooting, using an avicide (DRC-1339), or live trapping and euthanasia. The ravens would be preserved and offered to researchers to collect data on diseases (e.g., West Nile Virus [WNV] and avian influenza), genetics, or for museum collections. Young ravens and eggs found in nests of removed adults would be euthanized after being removed from the nest.

Due to the legal authorities and recognized expertise of APHIS-WS in wildlife damage management, the lead and cooperating agencies implementing lethal removal of ravens would contract this work to WS to be performed by their trained professional staff. The USFWS proposes to use the decision model described in Section 3.3.3 as the primary tool for the selection of common ravens to be removed.

3.3.3 Use of a Decision Model for Implementing Removal of the Common Raven

The *Wildlife Services Decision Model* (Slate et al. 1992) is adopted from the APHIS-WS decision-making process, which is a standardized procedure for evaluating and responding to wildlife damage complaints. The Decision Model is a description of the thought process used by wildlife management specialists, USFWS, and cooperating agencies to develop and implement the most appropriate method to reduce predation by the common raven on the desert tortoise through removal methods (Appendix C).

3.4 Description of Alternatives

This section describes 16 management alternatives. These alternatives were developed and analyzed to provide the full range of reasonable alternatives that provide levels of raven management, ranging from no programs beyond existing management, to a full-scale control program throughout much of the California desert. The current program provides a basis for comparing the management direction and environmental consequences of the other alternative actions. Of these16 alternatives, 10 were dismissed for various technical reasons (see Section 3.5) and 6 alternatives were carried forward.

3.4.1 Alternative A

The Current Program Alternative (Alternative A) describes the current level of management. This alternative would maintain the status quo and would not involve additional actions. This can be thought of as the current "program" alternative. Development in the California desert would continue with increased human subsidies for the common raven of food, water, nest sites, and roost sites. Activities currently being implemented by various federal, state, and local agencies to reduce the population of the common raven in the California desert are limited to a few efforts at selected locations. These current efforts include: reducing trash availability at landfills that have consulted with the USFWS, removing illegal dumps, fencing along highways to reduce road-kills, and installing perch guards on fences at the Desert Tortoise Natural Area. Many of these actions are nonfederal actions and do not require analysis under NEPA. Those

actions that are federal actions have been analyzed by the federal action agency through the NEPA process.

3.4.2 Alternative B

Integrated Predator Management Emphasizing Cultural and Physical Methods (removing ravens only after evidence of predation or attempted predation on young desert tortoises has been collected).

Alternative B would reduce human subsidies of food, water, nest, and roosting sites for the common raven, and includes aggressive nest removal. The survival of hatchling and juvenile desert tortoises would be expected to increase from the removal of ravens known to prey or attempting to prey on the desert tortoise.

This alternative applies the principles of integrated pest management (IPM); the biology of the animal dictates the appropriate method(s) and timing of management measures to implement. The primary focus of IPM is to reduce or eliminate the source, cause, or reason the pest species is attracted to a location and causes a problem, thus becoming a pest. The IPM uses nonlethal actions to reduce the number of animals causing problems. Sometimes this is sufficient to reduce the conflict. At other times, removal actions are also needed to achieve the goals and objectives of a pest management situation.

We anticipate that the number of common ravens that would be removed annually would be approximately 100 pairs of ravens and their associated offspring each year. This is 0.5 percent of the adult population and 2.4 percent of the total population (adults plus newly hatched birds). We also anticipate that the need to remove ravens would decline over time with the reduction in human-provided subsidies of food, water, and nest and communal roost sites for the common raven in the California desert. We propose to work with local, state, and federal agencies, and the public to implement management actions to effectively reduce human-provided subsidies to the common raven.

3.4.3 Alternative C

The Integrated Predator Management and Removal of Ravens from Desert Tortoise Management Areas.

Alternative C would implement the portion of the proposed action (Alternative B) on reducing human subsidies for food, water, nest sites, and roost sites, but expand the portion on removal of the common raven to include any raven found within a DTMA. The DTMAs include the desert wildlife management and critical habitat areas in Table 3-1. No evidence of predation on the desert tortoise would be needed to remove common ravens.

We estimate that approximately 2,000 ravens occur in the DTMAs and would be removed each year, or approximately 5.3 percent of the population in the California desert. We used the best available information on common raven population size, geographic area, and other factors to determine the number of ravens to be removed. The lethal removal methods described in Alternative B would be used for raven removal from DTMAs. This removal would occur during any time of the year. Only authorized wildlife specialists would conduct the lethal removals.

Table 3-1. Areas in the California Desert Designated for Management of the Desert Tortoise for Survival and Recovery

Desert Wildlife Management Area	Critical Habitat Unit	Recovery Unit	State	Critical Habitat Unit (acres)
Chemehuevi	Chemehuevi	Northern Colorado	California	937,400
Chuckwalla	Chuckwalla	Eastern Colorado	California	1,020,600
Fenner	Piute-Eldorado	Eastern Mojave	California	453,800
Fremont-Kramer	Fremont-Kramer	Western Mojave	California	518,000
Ivanpah	Ivanpah	Eastern Mojave	California	632,400
Joshua Tree	Pinto Mountain	Western Mojave	California	171,700
Ord-Rodman	Ord-Rodman	Western Mojave	California	253,200
Superior-Cronese	Superior-Cronese	Western Mojave	California	766,900

Under Alternative C, we propose to remove up to 2,000 common ravens per year from the DTMAs in the California desert. This is based on spending twice the effort as Alternative B, but because Alternative C allows for raven removal efforts in defined areas or DTMAs, the ability to remove more ravens in the same period of time would be much greater. Thus, if twice the effort is expended with a reduced need to spend time and money on logistics, we could remove up to 2,000 ravens.

Desert tortoises spend most of their time underground in their burrows where the temperature and humidity remain within a more moderate range than aboveground. The desert tortoise is an ectotherm or cold-blooded animal; its body temperature and metabolic rate are determined by the surrounding temperature. Like most animals, the desert tortoise does not tolerate high temperatures or low temperatures so it modifies its behavior and habitat to occupy space with moderate temperatures. This is accomplished by excavating and using burrows for the cold and hot periods of the year as well as the dry periods. Desert tortoises also use their burrows for protection from predators. Thus, desert tortoises are usually not aboveground at night, in the winter, summer, or hot or cold periods of spring and fall.

Desert tortoise usually emerges from their burrows in the daylight hours of spring to forage on the native annual and perennial herbaceous vegetation produced from the winter rains. They are aboveground for a short period to several hours a day replenishing their bodies with food to last them until the next spring.

For the common raven, the greatest demand for food is in the spring during the breeding season. Common ravens must increase their food intake (protein and calories) to produce eggs and feed nestlings. Breeding ravens actively defend their breeding territories and spend much of their time intensively hunting in these territories. This intensive hunting effort coincides with the active season for desert tortoises.

In 2004 and 2005, McIntyre (2006) observed that 5 percent of the common raven nests surveyed showed evidence of desert tortoise predation. Since two birds establish and use a nest for breeding, this means that about 10 percent of the breeding common ravens in the areas observed had evidence of preying on desert tortoises. If 2,000 common ravens are removed, approximately 10 percent or 200 birds were likely preying on desert tortoises. Thus, in

Alternative C, more common ravens are removed, but the number of ravens that were likely preying on the desert tortoise that would be removed is similar to Alternative B.

3.4.4 Alternative D

Alternative D provides for integrated predator management and removal of ravens from desert tortoise management areas and raven concentration areas.

This alternative would implement the actions proposed in Alternative C and would also incorporate raven removal in DTMAs and raven concentration areas, such as landfills. Under this alternative, about 3,000 to 7,000 ravens, or 8 percent to 18.7 percent of the population, would be removed each year from the California desert including urban and suburban areas. We used the best available information on common raven population size, geographic area, and other factors to determine the number of ravens to be removed. Ravens located at these concentration centers would be removed using any or all of the methods listed under the proposed action. This removal would occur during any time of the year. As described in Alternative B, only authorized wildlife specialists would conduct the removals.

In Alternative D, the level of effort to remove common ravens is three times that of Alternative B. However, the areas identified for raven removal include raven concentration areas. Thus a moderate increase in effort may produce a disproportionate increase in the number of birds removed. Although we estimate that 3,000 to 7,000 common ravens may be removed by this action under Alternative D, many of the ravens removed would be from sites where large groups of ravens feed. These feeding sites are the result of human activity that unintentionally provides a reliable food source for the common raven. Of the 3,000 to 7,000 common ravens that may be removed, we estimate that approximately 1,000 to 5,000 of them may likely be dependent on these human-provided food sources (e.g., landfills and agricultural sites) rather than nonhuman food sources (e.g., desert tortoise and other wildlife species). Therefore, removing 3,000 to 7,000 common ravens may provide us with similar results as Alternatives B and C, that is, the number of common ravens removed that are preying on hatchling and juvenile desert tortoise would be about 200 birds.

3.4.5 Alternative E

Alternative E provides for integrated predator management using only nonlethal cultural and physical methods.

This alternative would not remove common ravens from the California desert. It would reduce human subsidies of food, water, roost, and nest sites, includes aggressive nest removal of raven nests without eggs or nestlings. The primary focus of this alternative is to reduce or eliminate the source, cause, or reason that ravens are attracted to a location and cause a problem, thus becoming a pest. This alternative uses cultural and mechanical methods to reduce the number of ravens preying on hatchling and juvenile desert tortoises. This alternative would implement all of the nonlethal methods listed in Alternative B. Table 3-2 presents the anticipated environmental effects.

Table 3-2. Anticipated Environmental Effects

Issues	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Air Quality	None	None	None	None	None	None
Children and Low Income populations	None	None	None	None	None	None
Noise	None	None	None	None	None	None
Water Resources	None	None	None	None	None	None
Floodplains/wetlands	None	None	None	None	None	None
Cultural Resources	None	None	None	None	None	None
Geology and Soils	None	None	None	None	None	None
Hazardous Material/Waste[1]	None	None	None	None	None	None
Socioeconomics(project costs)	None	$200K	$400K	$550K	None	$200 – 550K
Recreation Impact[2]	None	5–10 days	10–20 days	10–20 days	None	5 – 20 days
Desert Tortoise[3]	Hundreds per year	Up to 75%	Up to 75%	Up to 75%	< 1–5%	Up to 75%
Ravens Removed[4]	None	215/yr	2000/yr	3000-7000/yr	None	215 – 7000/yr
Nontarget Species[5](200g/day/raven)	None	43kg	400kg	600-1400kg	13kg	43 – 1400 kg
Biodiversity/Ecosystem	None	None	None	None	None	None
Wilderness	None	None	None	None	None	None
Traffic	None	None	None	None	None	None
Sensitive Areas	None	None	None	None	None	None
Visual Resources	None	None	None	None	None	None

[1]All wastes and residues would be disposed of in compliance with all exist rules and regulations. The preferred avicide is nontoxic to mammals and most other vertebrates and is metabolized rapidly by ravens to nontoxic metabolites.
[2]Expressed as days not available for recreation purposes at a specific site
[3] This number would be expected to increase over time. The percentages are desert tortoises that would be expected to survive annually, that would otherwise be expected to be consumed by the raven.
[4]If nesting pairs are removed the nest and any nestlings would also be removed.
[5]The diet of ravens is known to vary greatly from juvenile to adult, from season to season, and from location to location. The impact on other wildlife is expressed here as a weight because of the known variation in diet composition.

3.4.6 Alternative F

Alternative F provides for the phased implementation of Alternatives B, C, and D, as needed.

We would remove common ravens by implementing up to three phases, as needed. The first phase, Alternative B, would remove up to 0.5 percent of the adult common ravens in the California desert, for which we have evidence that they are preying or attempting to prey on desert tortoises. This action would be implemented in combination with reducing human subsidies to ravens. If successful, we would only implement Alternative B. If effectiveness monitoring indicates that our actions are not successful, we would implement the second phase. The second phase, Alternative C, would be to remove up to 5.3 percent of the adult common ravens in the California desert and including removal of ravens in the DTMAs in combination with reducing human subsidies to common ravens. If effectiveness monitoring indicates that our actions are not successful, we would implement the third phase. The third phase would be to remove up to 18.7 percent of the common ravens in the California desert and would include removal of ravens in the DTMAs and raven concentration areas in combination with reducing human subsidies to ravens. We would remove only the minimum number of common ravens; ravens would be removed until there is no evidence of predation on the desert tortoise based on effectiveness monitoring results. Phased implementation with monitoring and adaptive management is necessary to determine the lowest level of removal that is effective in reducing raven predation on the desert tortoise to meet our goals in combination with implementing cultural and mechanical methods to reduce human subsidies to common ravens.

The methodology for determining whether to move to a greater or lesser removal of the common raven (e.g., from Alternative B to C or from Alternative C to B) would be through analysis of 3 years of effectiveness monitoring data. If the data indicate less than a 75 percent reduction in predation by the common raven on the desert tortoise for each year, the next phase or alternative would be implemented. If the data indicate a 90 percent or more reduction in predation by the common raven on the desert tortoise for each year, the previous phase or alternative would be implemented. If the results are between these thresholds, we would continue implementing the current alternative.

3.5 Alternatives Considered and Dismissed

Alternatives identified in the following paragraphs were offered by the public during the public scoping session or were developed by the lead/cooperating agencies. They were researched and/or analyzed, but dismissed from further consideration in this document for the reasons provided as follows:

a. Establish a hunting season and/or bounty for permitted hunters–Common ravens are protected under the MBTA. The MBTA has two designations for listed birds, nongame (which includes the common raven) and game (hunted). The common raven is listed as a nongame migratory bird under the MBTA and California Fish and Game Code; there is no provision under MBTA for the general public to hunt nongame birds. To establish a hunting season for common ravens in California, ravens would need to be moved from the nonhunted list to the hunted list. To do this, the USFWS would propose new regulations to hunt common ravens. The process

includes developing the proposed regulations, publishing them in the *Federal Register* and soliciting public comment, complying with NEPA, and then finalizing the regulations depending on information received during the comment period (Mike Green, USFWS, personal communication). Because of the time involved, the workload of the agency, the importance of this action when weighed with other actions, the likelihood of this alternative occurring is unlikely in the near future.

If the change in designation occurred at the federal level, ravens could not be hunted in California until the California Fish and Game Commission approved changes to the state regulations to allow hunting for sport (Mike McBride, CDFG, personal communication).

If the federal and state regulations were changed, establishing a hunting season for ravens would not necessarily achieve the goal of reducing predation of the common raven on the desert tortoise. Not all ravens prey on desert tortoises. A hunting season for ravens would not target the offending birds. Hunting would not occur throughout the desert. Hunting ravens or any other animal is generally not allowed within city limits or near a dwelling in unincorporated areas. This restriction and the ever-changing urban-wildland interface would make it difficult to hunt ravens in many locations in the California desert. Ravens that are actively hunted become more wary of humans and more difficult to hunt or manage. For these reasons, this alternative is not considered realistic or effective and is eliminated from further consideration.

b. Establish an Adopt-a-Raven Program. This alternative would require live-trapping common ravens, locating willing individuals or organizations to adopt and care for the birds and establishing a licensing program to track the placement and care of these birds. The MBTA and California Fish and Game regulations (California Fish and Game Code 3800 and Title 14, Section 671) prohibit the capture and possession of native nongame birds, including common ravens, except under special circumstances of research or education (Michael Green, personal communication; Hank Hodel, CDFG, personal communication). Under the MBTA, wild birds may be held for scientific and educational purposes. An adoption program for the common raven, a nongame bird, would not meet either of these two requirements. Generally, education permits are granted to persons who will use the birds for educational purposes. In these situations, birds are not removed from the wild. Rather, birds that cannot be rehabilitated to the wild are used for educational purposes. Permits under the MBTA are not granted for adoption purposes; there is no provision in the MBTA for that type of permit. For these reasons, this alternative is not considered realistic and will not be evaluated further.

c. Trap and Relocate Ravens–This alternative would require live-trapping common ravens, moving them to another location, and releasing them. Stiehl (1978) recommends that ravens be moved a minimum of 125 miles (200 km) to increase the success of the relocation. Both the USFWS's Office of Migratory Birds and CDFG would need to issue permits prior to trapping and relocating ravens. Concerns about transmitting diseases (e.g., WNV), moving the rising numbers of ravens throughout California, and transferring a predation problem from one location to another were concerns expressed by CDFG. For these reasons, they would not permit this alternative (e-mail dated August 15, 2006). Also, there is little information available that demonstrates that relocation would be successful, that is, that the relocated ravens would remain at their new location. Without approval from the regulatory agencies, this alternative is not possible. This alternative will no longer be considered.

d. Provide Another Food Source for Ravens–The current condition is that new food sources were provided for ravens by humans in the California desert. Common ravens freely eat from waste and garbage associated with human development, animals killed on roads, and water associated with human development. These human subsidies have contributed to increased survival of raven offspring and reduced mortality of adults, leading to the population increase. Continuing to sustain or increase the availability of food and water for ravens would only exacerbate the current predation problem on the desert tortoise, not reduce it. Because this alternative would likely result in increased numbers of ravens and increased predation on the desert tortoise, it would not help achieve the goal and is eliminated from consideration.

e. Implement Visual or Auditory Aversion for Ravens–Visual and auditory aversion usually consists of bright flashes of light, effigies, and loud noises. While visual and auditory aversion training has been used on ravens, its utility was limited to a few territorial birds preying upon a concentrated food source (i.e. least tern eggs in a tern nesting colony, Boarman and Heinrich 1999). Ravens frequently learn to disregard aversion methods such as "hazing" in a short period of time. Shooting to supplement harassment typically enhances the effectiveness of harassment techniques and can help prevent bird habituation to hazing methods (Kadlec 1968).

f. Conditioned Taste Aversion (CTA)–This aversion involves training animals to form an association between particular foods or prey item and a negative consequence. For CTA, this negative consequence is illness. Theoretically, after "teaching" the animal to avoid the food item using CTA, even food items that have not been treated with the aversion agent should be avoided.

This is a form of behavioral modification. The target prey or a close mimic of the target prey is laced with a substance that causes illness when consumed by a common raven. The raven learns that eating the prey or mimic will make it sick. This method has limited application and is unlikely to work given the scale of this project. Aversion training is recommended for use when only a few individuals are the target, a large amount of time can be invested, and the problem area is limited in geographic area. The California desert covers more than 25 million acres. Implementing an aversion program for ravens on this scale of landscape would be extremely expensive, time consuming, labor intensive, and annoying to people. Currently, there are no suitable products registered for CTA use. Using CTA with a carcass or likeness of a prey species may result in adverse effects to nontarget species. Nontarget species may be attracted to the carcass or likeness and consume the illness-causing substance. Problems associated with this method include: locating a suitable mimic for hatchling and juvenile desert tortoises; shielding nontarget individuals and other species from adverse effects; monitoring during the conditioning period; implementing the method on a region-wide or desert-wide area, and implementing a method that has little data to demonstrate its effectiveness and longevity. For these reasons, this method is eliminated from consideration.

g. Introduce a Predator for Ravens–Past wildlife management activities have shown that introducing nonnative predators to an ecosystem greatly upsets the balance of the system and usually leads to undesirable consequences, (i.e., mongoose in Hawaii). Executive Order 13112 directs federal agencies to prevent the introduction of invasive species. For those already present, it provides for their control to minimize the economic, ecological, and human-health impacts that invasive species cause, subject to availability of appropriations. Currently, there are few native predators of the common raven in the California desert. Eggs and nestlings are

potential prey for other ravens and a few birds of prey. Adult ravens have no known predators. Because of the large-scale consequences of such actions; the time, expense, and permits required to test this nonnative predator alternative; the requirement to comply with Executive Order 13112 on invasive species; the NEPA compliance requirements; and monitoring requirement following implementation; this alternative was not considered reasonable and was eliminated from further consideration.

h. Implement a Birth Control or Chemical Sterilization Program–Birth control or chemical sterilization programs have shown some promise in some animal pest situations (i.e., Canada geese in urban area). Implementation of an effective birth control method for the common raven could reduce the raven population over time. However, its implementation is not possible at this time. There is no approved contraceptive for the common raven. Administering the proper dose of an approved contraceptive to a wild noncaptive animal would be difficult to do in a safe and effective manner. Underdosing would be ineffective. Overdosing may cause serious health issues for the individual animal. To ensure the contraceptive is administered properly, each adult raven would be trapped, the contraceptive administered seasonally or annually, and the bird marked to ensure that it does not receive multiple doses. If administered on a large scale, this method would eventually reduce the raven population over time. However, it would not remove any of the individual ravens who would continue to prey on juvenile desert tortoise. Since ravens can live 10 to 14 years, the ravens known to prey on juvenile desert tortoises would continue to adversely affect the survival of hatchling and young desert tortoises. We encourage the continued study and development of a contraceptive program, but at this time, it is not a viable option and will not be considered.

i. Allow Diseases (e.g., WNV and Newcastle's Disease) to Reduce the Raven Population–While WNV can have a 95-percent mortality on some corvid species, this level of mortality has not occurred in raven populations in the California desert. This absence of documented mortality in the raven populations in the California desert indicates that WNV will not likely have a large effect on these populations. West Nile Virus also adversely affects horses and humans. The equine community would likely be opposed to this approach as WNV can cause death (Trock et al. 2001). The Centers for Disease Control, State and County Vector Control, and health departments will not allow this disease to "run its course" in the wildlife population because the risk to human health is too great.

Newcastle's disease is cause by a paramyxovirus. An outbreak of the disease rarely occurs in the United States because of strict quarantine requirements for importing birds. Migratory and free-ranging wild birds appear to have little impact on spreading the disease. It is frequently fatal to poultry and is highly regulated by the USDA and other agencies (Wissman and Parsons 2004). Once detected, the USDA and California Department of Food and Agriculture impose strict quarantines on transporting poultry and other birds to and from the quarantine area. Thus, outbreaks of Newcastle's disease are rare and quickly eradicated.

Given the detrimental effects these diseases have on other species, this option is not considered a reliable or reasonable way to achieve the objectives.

j. Control/Reduce Human Population Control–Several citizens stated that the real problem for desert tortoise recruitment is not ravens, but rather humans and human activities and

development. The proposed action contains elements to educate the public on the benefits of changing some of its activities that subsidize the common raven, but the lead and cooperating agencies for this document does not have regulatory authority over the expanding human population in the desert and the associated increased human development. It was agreed that reducing or slowing development in and adjacent to the desert would reduce adverse effects to the desert tortoise for several reasons. However, this is only one of a myriad of threats to the desert tortoise (Tracy et al. 2004). All of the alternatives carried forward have incorporated, in part, certain aspects of this alternative.

k. Modify all utility poles and towers to preclude raven perching or nesting–With respect to precluding perching on human-built poles and towers, this alternative was considered, but dismissed for the following reasons:

1) Perch availability does not likely limit raven population size; ravens do not rely on perch sites for hunting like some raptors;

(a) Eliminating human-made perch sites would adversely affect other avian species that use these perches for resting and hunting; and

(b) There are thousands of utility poles and towers in the California desert so modifying these structures would be expensive and take several years to complete.

2) With respect to precluding nesting, this alternative was considered and dismissed for the following reasons:

(a) Eliminating human-built nest sites would adversely affect other avian species that use these sites for nesting;

(b) There are thousands of utility poles and towers in the California desert so the modification would be expensive and take several years to complete;

(c) We would need the cooperation of the utility companies complete this task; and

(d) A study would need to be conducted to determine an effective design prior to successfully modifying the towers and poles.

4.0 ENVIRONMENTAL CONSEQUENCES INTRODUCTION

This section forms the scientific and analytic basis for the comparison of alternatives. It consolidates the discussions of the following elements:

a. The environmental impacts of the alternatives for the proposed action,

b. Any adverse environmental effects which cannot be avoided should the proposal be implemented,

c. The relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

d. Any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented.

Cumulative impacts are discussed for each alternative.

4.1 Significance Criteria (by Resource Area)

In the Council on Environmental Quality's regulations for implementing NEPA (Section 1508.27), "significantly," as used in NEPA, requires considerations of both context and intensity:

a. Context–This means that the significance of an action must be analyzed in several contexts such as society as a whole (human/national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

b. Intensity–This refers to the severity of impact.

Table 4-1 presents the significant criteria that were developed and used to evaluate the various potential impacts to each resource area for each alternative considered.

The impacts of the various alternatives are summarized in Table 4-2.

4.2 Alternative A–(Status Quo Alternative)

4.2.1 Impact on the Target Species (Common Raven) Population

The current program alternative should have negligible to minimal beneficial impacts to the common raven population in the short- and long-term. Although several agencies have implemented efforts to reduce human subsidies of food, water, and nest and roost sites for the common raven, these efforts are localized, small, and are unable to keep up with the increases in these subsidies from the growing human development in the California desert. Ongoing efforts to reduce human subsidies to the common raven have shown little change in raven population levels from the early 1990s to 2004 (Boarman and Kristan 2006). Currently there is no known effort to remove common ravens from the California desert (Craig Coolihan, USDA APHIS, personal communication).

Table 4-1. List of Significance Criteria to Determine the Threshold for Significance Regarding Various Potential Impacts for each Resource Area

Biological Resources and Ecosystems Vegetation and Wildlife	**Significance Criteria of the Proposed Action**
Listed, proposed plants and animals	Causes mortality, permanent habitat loss, or lowered reproductive success for individuals of state or federally listed threatened or endangered plant or animal species or plants or animals proposed for state or federal listing as threatened or endangered
Candidate species	Causes mortality, permanent habitat loss, or lowered reproductive success for major portions of candidate plant or animal species for state or federal listing or identified by California Native Plant Society (CNPS) as rare, threatened, or endangered in California
Fully protected species	Causes mortality, permanent habitat loss, or lowered reproductive success for wildlife species designated by the state of California as fully protected species
Plant and animal species	Reduces a plant or wildlife species to a level that meets the definition of threatened or endangered
Habitat loss, degradation, biodiversity	Diminishes habitat for fish, wildlife, or plants by the loss of a greater than 10 percent of the available habitat or number of individuals of any plant or animal species (sensitive or nonsensitive species) that could affect the abundance of a species or the biological diversity of an ecosystem beyond normal variability
Activity patterns for listed and candidate species and species of special concern	Causes long-term or permanent disturbance or displacement by human activities of substantial portions of local populations of state or federally listed, proposed, or candidate plant or animal species, or species of special concern including areas used as movement corridors or areas that provide connectivity among populations
Sensitive, unique habitats	Causes the measurable degradation or loss of sensitive or unique habitats
Socioeconomics	**Significance Criteria**
	Places a change of greater than 10 percent of current demand on the services in local communities in the project area
	Causes the population to exceed historic growth rates or substantially affects the local housing market and vacancy rates.
	Causes a substantial increase in out-of-pocket expenses by local communities or individuals
	Decreases or increases the baseline of local employment levels by more than 10 percent or alters substantially the location and distribution of the population within the geographic region of influence
	Prevents continuation of existing authorized off-highway vehicle recreation use
	Prevents continuation of the existing hunting and fishing programs
	Increases or decreases by more than 10 percent the availability of any other recreation resource which results in demand for the remaining facilities to exceed their capacity
Human Health and Safety	**Significance Criteria**
	Exposes people to potential health hazards
	Is inconsistent with existing health and safety regulations

Table 4-2. Comparison of the Environmental Impacts of Each Alternative with Resource Issues

Description	Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Raven Populations	**Minimal Beneficial**, Raven populations would be expected to expand and follow human development in the California desert	**Negligible Adverse**, Raven populations would be decreased by less than 0.5 percent of the existing raven population in the California desert	**Minimal Adverse**, Raven populations would be decreased by about 5 percent in selected areas of the California desert, however, raven populations would still be well above the historic levels for these areas, and be considered viable and self sustaining	**Minor Adverse**, Raven populations would be decreased by about 19 percent across the California desert; however, raven populations would still be well above the historic levels for these areas, and be considered viable and self sustaining	**Negligible Adverse**, Raven populations would be expected to grow or remain steady initially, then decrease slowly in the California desert because only cultural and physical means to manage ravens would be used	**Negligible Adverse to Minor Adverse,** Raven populations would decrease between 0.5 and 19 percent across the California desert; however, increases from ongoing population growth would reduce this rate of decrease; raven population would remain well above historic levels and be considered viable
Desert Tortoise Populations	**Moderate Adverse**, Hundreds of juvenile desert tortoises would continue to be killed by ravens each year and this number would be expected to increase	**Moderate Beneficial**, Numerous Additional hatchling and juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population and reproduce	**Moderate Beneficial**, Numerous additional juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce	**Moderate Beneficial**, Numerous additional juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce	**Minimal Beneficial**, Slowly more juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce	**Moderate Beneficial**, Numerous additional juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce
Other Wildlife	**Moderate Adverse**, Slow continued predation pressure from a growing raven population, competition for other resources (space and water)	**Minor to Moderate Beneficial**, Populations of prey species for ravens would likely increase with the reduction of predation by the common raven	**Minor to Moderate Beneficial**, Populations of prey species for ravens would likely increase with the reduction in the numbers of predatory ravens	**Minor to Moderate Beneficial**, Population of prey species used by ravens would likely increase with the reduction in the numbers of predatory ravens	**Minimal Beneficial**, Slowly Populations of prey species used by ravens would likely increase with the reduction of predation by the common raven	**Minor to Moderate Beneficial**, Population of prey species used by ravens would likely increase with the reduction in the numbers of predatory ravens
Socioeconomics	**No Change or Non**e, No additional funds would be brought to the area, no change in life style lifestyle in the area	**Negligible Beneficial,** $200K effort, limited to 4 months per year	**Negligible Beneficial,** $400K effort, ravens could be killed anytime	**Negligible Beneficial,** $550K effort, ravens could be killed anytime	**No Change to Negligible Beneficial**, Reduction in food and water subsidies results in reduced water costs	**Negligible Beneficial,** $550K effort, ravens could be killed anytime
Human Health and Safety	**Negligible Beneficial**, Reduction in some unauthorized dumps would reduce possible spread of disease, etc.	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait, however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease, etc.	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait, however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease, etc.	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait; however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease	**None to Negligible Beneficial**, Better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait; however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease

Table 4-2. Comparison of the Environmental Impacts of Each Alternative with Resource Issues (Concluded)

	Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Recreation	**Negligible Adverse and Beneficial,** Some recreational opportunities may be restricted during illegal dumpsite cleanup; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial,** Some recreational opportunities may be restricted during illegal dumpsite cleanup; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase

Notes:
1. No Change or None–There are no impacts expected.
2. Negligible–The impacts are very small and possible, but not probable or likely to occur.
3. Minimal–The impacts are not expected to be measurable and are within the capacity of the impacted system to absorb the change, or the impacts can be compensated for with little effort and resources so the impact is not substantial.
4. Minor–The impacts are measurable, but are within the capacity of the impacted system to absorb the change, or the impacts can be compensated with limited effort and resources so the impact is not substantial.
5. Moderate–Potentially adverse impacts that are measurable but do not violate any laws or regulations and are within the capacity of the impacted system to absorb or can be mitigated with effort and/or resources so that they are not significant.
6. Major–Potentially adverse impacts that individually or cumulatively could be significant.

4.2.2 Impact on Nontarget Species

4.2.2.1 Desert Tortoise

The current program alternative would not achieve the purpose of and need for the action. Under this alternative, the impact to desert tortoises would be moderate and adverse for the short- and long-term. Current efforts to reduce human subsidies to the common raven have been localized and scattered. They have shown little change in raven population levels and no increase in the percent of juvenile and hatchling desert tortoises in the California desert. Under this alternative, we expect raven predation to continue to remove hatchling and juvenile desert tortoises at the same or increasing levels because of the current and projected increased human development in the California desert. Recruitment of hatchling and juvenile desert tortoises to the adult population would be minimal to nonexistent in some populations.

4.2.2.2 Other Nontarget Species

The impacts to the Mohave ground squirrel and other native wildlife species (excluding the desert tortoise) that are prey for the common raven would be moderately negative for the short- and long-term. Recent limited efforts to reduce human subsidies of food, water, and nesting/perching sites have shown little change in the population level of the common raven. Common ravens are efficient hunters and scavengers. They prey on birds (eggs, nestlings, and adults), snakes, lizards, rodents, and lagomorphs (rabbits and hares). Under this alternative, we expect raven predation to continue at a similar or increased level on these species.

Under the current program alternative, there are no methods used that directly affect common ravens (e.g., trapping and shooting). The only methods currently implemented are limited actions in the local areas to reduce human subsidies, primarily food and water. Wildlife species that use these human-subsidized food and water sources would be adversely affected by this alternative. The primary species that would be adversely affected would be the coyote (*Canis latrans*). As a scavenger of road kill and garbage, the human-subsidized food source for the coyote would be reduced.

4.2.3 Impact on Socioeconomic Issues

Current efforts to reduce human subsidies, such as food and water, to the common raven have resulted in no changes to human lifestyle or addition of funding or cost to the area. The cleanup of illegal dumps, which has been limited in number and location, would result in no effect on the lifestyle of the human population in the California desert. Efforts to reduce standing water on some federal lands should result in no effect to human lifestyle.

4.2.4 Impact on Recreation

Under the current program, no activities would be conducted in desert tortoise habitat with the exception of cleanup of illegal dumps. These sites are usually small and located near communities. The cleanup activities may deter from the recreation experience in the immediate area for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the short-term localized adverse effects of

cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup and negligible beneficial impacts afterward.

4.2.5 Impact on Human Health and Safety

Measures that would be implemented include removal of illegal dumps and eliminating standing water on some federal lands. Illegal dumps may contain hazardous substances or harbor diseases. Since they are usually easily accessible, the public is at risk of exposure to these hazards. They also contain debris, which can cause injury or death to anyone inspecting or playing at a dumpsite. Some of the measures would provide limited improvement to human health and safety, as their locations are limited in number and size.

Standing water in a warm environment is a breeding habitat for mosquitoes that carry diseases. Encouraging agencies to manage their outside watering to eliminate standing water, which subsidizes the common raven, would also reduce the likelihood of mosquitoes breeding and carrying diseases (WNV). Implementation of this alternative would have a negligible beneficial impact on human health and safety.

4.2.6 Effectiveness/Conclusion

Based on the description of the Need for Action, the current program is not providing an acceptable level of reduced mortality and increased recruitment for the desert tortoise. This alternative would not meet the purpose and objectives of the proposed action. The current program alternative is not expected to be as effective as the other alternatives. It would not allow for the lethal removal of common ravens known to prey on hatchling and juvenile desert tortoises, and it would not implement a large-scale "cultural and physical" program by federal, state, and local agencies and the public. Elevated levels of predation by the common raven on the desert tortoise would continue. There would be no immediate relief to allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the adult population. Without implementation of a large-scale outreach program and "cultural and physical" program by agencies and the public to reduce human subsidies to the common raven, raven predation would continue to remove hatchling and juvenile desert tortoises at a rate similar to or greater than the current rate. The desert tortoise population in the California desert, especially in the Western Mojave Recovery Unit, would continue to decline. If this rate of decline continues, it could result in a decline in status of the desert tortoise in California to that of endangered and a decline toward extinction for the west Mojave population.

4.3 Alternative B–Integrated Predator Management with Limited Removal of Ravens

4.3.1 Impact on the Target Species (Common Raven) Population

In analyzing the impact of this removal action on the common raven population, we used the following process. Under this alternative, we would expect to remove approximately 100 pairs of ravens and their nests and approximately 4 ravens from each of the desert tortoise head starting facilities per year. The population estimate for the common raven in the California desert is about 37,500 birds. Removing about 200 common ravens per year would mean removing about 0.5 percent of the raven population. Because predation on the desert tortoise by common ravens is a learned behavior, not all common ravens prey on desert tortoises.

Removing 100 pairs of ravens and 7 eggs (maximum clutch size) per year, per nest, would mean removing 2.4 percent of the raven population in the California desert. This is a worst-case scenario, as not all nests would have seven eggs, not all eggs would be viable, not all viable eggs would hatch, and not all nestlings would survive to fledge and eventually reproduce. A demographic model of the Mojave raven populations indicated that this level of removal would have no impact on raven population viability because more than 99 percent of the population would remain after implementation (Boarman and Kristan 2005).

Direct impacts to the selective removal of only those ravens with evidence of predation or attempted predation on hatchling and juvenile desert tortoises using trapping, shooting, or the use of toxicants would have negligible adverse impacts to the raven population in the California desert. Raven population numbers would be at historically high levels after selective removal and well above that of the population in the early and mid-twentieth century (Appendix A, Section 2.0). The number of birds removed would depend on several variables: effectiveness of cultural and physical methods to reduce raven predation on the desert tortoise, number of ravens identified as preying on desert tortoises that would be removed, availability of staff, and funding. Trapping, shooting, and use of an avicide would be limited to those locations where nesting ravens were documented as preying on hatchling and juvenile desert tortoises. Given the large numbers of common ravens in the California desert, a new breeding pair would likely take the place of the removed pair. Not all ravens prey on desert tortoises (See Section 1.1.2, and Appendix A, Section 2.7 of the EA).

We anticipate that the removal of 100 pairs of common ravens annually would result in an increase in the raven population in the California desert. Between 1966 and 1999, ravens in the Mojave Desert had an annual population increase of 5.4 percent and 7.1 percent in the Colorado Desert (Liebezeit et al. 2002).

There is the possibility that ravens that do not prey on desert tortoises may be removed. This possibility should be minimal. We would use information on the behavior and biology of the common raven, including the following, to tailor a method to identify and remove common ravens preying or attempting to prey on desert tortoises. Implementing this process should ensure that the appropriate ravens are targeted for removal. Nesting common ravens actively defend their nest territory from other large birds including other ravens, usually to a distance of 2 miles from the nest. The time when tortoise-preying ravens would be identified is during or immediately following the breeding season when they are actively defending their territories. This means that other ravens would not likely enter and remain in these territories. In addition, this process would include identifying desert tortoise remains with evidence of raven predation within ¼ mile of a raven nest. If desert tortoise remains with characteristic signs of raven predation are found within a territory, the conclusion would be that the ravens defending that territory were the ravens responsible for the desert tortoise mortality.

At the desert tortoise head start facilities, only those common ravens that attempt to enter the facilities that hold hatchling and juvenile desert tortoises, and thereby prey on desert tortoises, would be removed.

Indirect impacts would include the implementation of cultural and physical methods. These methods include reducing human subsidies of food, water, and nest and roost sites for the

common raven, and removing unoccupied raven nests. The number of unoccupied raven nests that would remove annually is unpredictable at this time. However, we would limit our actions to removing 1,500 unoccupied nests or less per year. This estimate is considered high and is derived from the sampling effort of McIntyre et al. (2006). Its implementation is contingent upon funding and/or availability of staff. The impacts of removing nests on the common raven would not result in the death of ravens or their eggs or nestlings; however, it may increase the expenditure of energy by a raven pair to construct a new nest.

Indirect impacts would include the removal of common raven nests and the reduction in the availability of food, water, and nest and roost sites for the common raven throughout the California desert. As mentioned above, removal of up to 1,500 unoccupied nests would likely increase the amount of energy that a pair of common ravens would use to construct a new nest. It may also result in fewer successful nests and reduced recruitment. Reduction of human-subsidized food, water, and nest and roost sites would likely result in the California desert not being able to support the same high number of common ravens that currently occur in the area.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.2 Impact on Nontarget Species

4.3.2.1 Desert Tortoise

Actions to remove common ravens that prey on desert tortoises should have a moderate beneficial impact on desert tortoise populations in those areas. For declining populations of long-lived animal species, such as the desert tortoise in much of California, annual mortality of juvenile tortoises should not exceed 5 percent to ensure recruitment of new individuals into the breeding population and to help return the population to stable numbers (Congdon et al. 1993). Since nesting common ravens have a greater need for calories and protein in the spring and their hunting territory is limited in size during the nesting season and intensively searched, one pair of common ravens can prey on numerous hatchling and juvenile desert tortoises in a year. McIntyre et al. (2006) determined through recent surveys that 27 and 28 nests, in 2 survey years, had evidence of desert tortoise predation beneath them. While the surveys did not cover the entire California desert, they did represent a sample of the California desert. When applying this rate to the California desert, we estimate that approximately 100 pairs of breeding common ravens annually are responsible for most of the predation on hatchling and juvenile desert tortoises during the breeding season. The removal of these ravens annually should result in an immediate response of hundreds of hatchling and juvenile desert tortoises now having a higher probability of survival, reaching adult size, and reproducing. They would be able to help slow and reverse the dramatic population declines in the west Mojave Desert and contribute to the long-term survival and recovery of the desert tortoise. Implementing actions that would have an immediate and beneficial impact is essential as the population of the desert tortoise has continued to decline.

The increased efforts to reduce human subsidies of food, water, and nest and roost sites for the common raven would eventually indirectly benefit desert tortoise populations, as these methods would require time to implement and to affect the common raven population. Over

time, the number of common ravens that prey on hatchling and juvenile desert tortoises would be reduced. The population size for the common raven would decline over time in the California desert. Once the reduction of human subsidies is fully implemented throughout the California desert, the number of hatchling and juvenile desert tortoises that survive to reproductive adult size should increase. We estimate that achieving full implementation would take a minimum of 10 years.

Reducing the availability of human-subsidized food, water, and nest and roost sites for the common raven, would not likely place more predation pressure on the desert tortoise. Historically, common ravens were neither abundant nor resident birds in the California desert as they are today. For ravens to continue as abundant resident birds, all of their life needs (e.g., food, water, shelter, and reproduction needs) must be available and not be difficult to obtain. Reducing one of these life needs means that the common raven must expend additional energy to find new supplies of this life need. Reducing more than one life need compounds the energy expended. The more energy expended, the less likely common ravens would remain at their current location. Moving to a new location may expend less energy than searching for a new food source at the current location, thus common ravens would leave those areas of the California desert that did not provide them with their life needs, based on energy expenditure. For example, reducing or eliminating human-subsidized food sources (e.g., landfills, illegal dumps, open trash cans and dumpsters, and road kill) would force ravens to expend additional energy to hunt for food.

The removal of unoccupied common raven nests would indirectly benefit the desert tortoise. During the breeding season, the number of successful raven nests would be reduced. Some of these ravens would be those that prey on hatchling and juvenile desert tortoises. With no offspring, the adult ravens would not be able to teach their young how to prey on desert tortoises. The increased demand for food to support adult female ravens with developing eggs and hatchling ravens in the spring would be eliminated, but the demand for food to maintain the existing raven population would continue. This reduced demand for food in the spring for common ravens coupled with normal population mortality, would likely mean decreased predation pressure by ravens on desert tortoises during the tortoise's primary activity period. The benefits of decreased predation by the common raven on the desert tortoise population from nest removal, would likely take time before producing measurable results. Reduced predation pressure would eventually result in a greater percentage of hatchling and juvenile desert tortoises recruited to the adult population, thus contributing to recovery.

There is one indirect impact of this alternative that is a potential negative impact to the desert tortoise; it is negligible but possible. Desert tortoises may be injured or killed by vehicles carrying project employees. This possibility would be mitigated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on desert tortoise awareness.

4.3.2.2 Other Wildlife Species

This alternative would have several indirect impacts to other wildlife species and would be similar to impacts to the desert tortoise. Most impacts would be minor to moderate and beneficial. Removing approximately 100 pairs of common ravens annually that prey on other species of wildlife such as small birds, bird eggs, nestlings, lizards, snakes, small mammals and

invertebrates would mean that these animals would have a greater likelihood of surviving, reproducing, and contributing to the long-term survival of their respective species.

Methods to reduce human subsidies of food, water, and nest and roost sites are expected to reduce common raven numbers in the long-term; thereby, reducing predation by the raven on other wildlife species in the California desert. Because this alternative focuses on removing common ravens that prey on desert tortoises, it would likely have a beneficial effect on other prey species of the common raven including lizards, snakes, diurnal rodents (including the state threatened Mohave ground squirrel), birds, eggs, and nestlings. The benefits previously described for the desert tortoise should also apply for wildlife species that are prey for the common raven. Removing common raven nests may benefit raptor species, as more undefended locations with nest sites would become available in the California desert.

Reduction of human-subsidized water sources may also reduce water subsidies for other wildlife species such as coyotes, native and nonnative rodents, and some species of native and nonnative birds. The majority of nontarget desert wildlife species are not dependent on human-subsidized sources of water. The locations of most native wildlife are not near human-subsidized water sources. This distance precludes use by native wildlife. This impact would be minimal and adverse.

The removal of unoccupied common raven nests would indirectly benefit other species of wildlife. During the breeding season, the number of successful raven nests would be reduced. All of these ravens would at some time prey on other species of small wildlife. The increased demand for food to support adult female ravens with developing eggs and hatchling ravens in the spring would be eliminated, but the demand for food to maintain the existing raven population would continue. This reduced demand for food in the spring for common ravens coupled with normal population mortality over time would likely mean decreased predation pressure by common ravens on other wildlife species. For many desert wildlife species, spring is their primary activity period. The benefits of decreased predation by the common raven on other wildlife species from nest removal would likely take time before producing measurable results. Reduced predation pressure would eventually result in a greater percentage of young individuals recruited to the adult population, thus contributing to long-term viability.

One potential indirect and adverse impact to other wildlife species is implementation of the removal methods for the common raven (shoot, trap and euthanize, and use of an avian toxicant). However, their implementation should have little probability of removing species other than common ravens as their design and implementation would minimize this possibility. Shooting requires seeing the target animal before discharging the firearm. Common ravens are large birds and easily distinguished from other desert avian species. The location of the avian toxicant would be aboveground where ground or climbing animals would not have access. The selection of eggs as bait would minimize herbivorous and carnivorous species of birds from being attracted to and consuming the bait. The eggs would be "tied down" so common ravens could not cache the bait where it might be found and consumed by other animal species. The avian toxicant (DRC-1339) is not lethal to most birds that might be attracted to the hard-boiled eggs. Most species of birds are nonsensitive to DRC-1339. However, the use of the avian toxicant could accidentally cause illness in other avian egg-eating species such as golden eagles and roadrunners. The possibility of trapping or poisoning nontarget species would be unlikely.

Traps and bait sites would be monitored and modified, if necessary, to ensure that nontarget species do not take the bait. The toxicant is metabolized quickly and would not be lethal to other species that might scavenge raven carcasses (Cunningham et al. 1979).

Another indirect negative impact that is possible, but not likely to occur is injury or death from vehicles carrying project employees. This possibility would be mitigated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on awareness of wildlife species.

The level of potential impact from this alternative to the nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.3 Impact on Socioeconomic Issues

The indirect impacts to socioeconomics include funding for raven removal, implementation of raven removal, and cooperative efforts among local agencies and others to provide better management of human-subsidized resources. The expenditure of funds to implement removal of common ravens (shooting, trapping and euthanasia, and use of an avian toxicant) that prey or attempt to prey on desert tortoises would provide beneficial impacts to socioeconomic issues. We estimate that implementation of these removal actions would cost about $200,000 per year and would occur during a 4-month period per year. The impact of spending this amount to the economy of the California desert would be beneficial and negligible.

Additional indirect impacts include implementation of the three methods to remove common ravens on nearby human populations. These impacts would be localized. Often these activities would not occur near communities. If they do, their effects would be limited in duration and isolated, and should have minimal impacts on human lifestyle. Shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities directly; these activities would occur in the desert, not within communities or settlements. Trained professionals from APHIS-WS would implement these removal methods.

Part of the proposed action is to work with cities, and encourage counties and the public to implement existing ordinances or develop processes that manage the disposal and storage of solid waste, conserve water, and minimize opportunities for human-created nesting and roost sites (e.g., communication towers, power-line towers, and shade structures) to reduce human subsidies of the common raven. Implementation of these programs would likely indirectly impact human values and lifestyles. The public would be informed about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions (e.g., water conservation, reduced water bills, and reduction in occurrence and cleanup of illegal dumps). They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions would result in effective management of solid waste, hazardous materials, water, and vertical structures that would reduce the raven population and benefit the human population. The impacts to socioeconomics of the area, from implementation of Alternative B, would be negligible and beneficial.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. This includes hunting and off-highway vehicle use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities exist for various forms of recreation on lands managed by the BLM and NPS.

The implementation of common raven removal would indirectly impact recreation. At removal locations for the common raven, small, localized areas may be unavailable for humans to enter. For example, if APHIS-WS determines that shooting is the best means to remove a predatory raven at a particular location, the area may be closed to human access for part of the day to ensure that no one is accidentally injured of killed. The APHIS-WS would consider any public activity patterns at those areas as part of the decision process to select the method and time to remove identified common ravens. This temporary closure of a localized area would not allow the public to recreate in that area at that time. Most public use for recreation occurs on weekends and holidays. This time period would be avoided. However, the frequency and duration of a closure at a particular location, given the total area available in the California desert for recreation, would be negligible. The USFWS and APHIS-WS would consult with the BLM, NPS, California Department of Parks and Recreation, and the CDFG to minimize adverse impacts on scheduled activities, where appropriate. Effective implementation of this alternative over time would result in greater opportunities for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The impacts would be negligible and adverse initially and negligible and beneficial over time.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.5 Impact on Human Health and Safety

The implementation of this alternative would result in indirect impacts to human health and safety. Measures to avoid adverse impacts to human health and safety are included in the proposed action through use of the *Wildlife Services Decision Model* (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety is listed in Section 3.2.3 of the Wildlife Services Environmental Impact Statement (EIS). Many of the procedures intended to minimize impacts on recreation would also minimize or eliminate risks to human health and safety. For example, if shooting is selected as the method to remove identified ravens, the area would be closed to human access to prevent accidental injury or mortality. If use of an avicide is selected, methods would be implemented that would avoid or minimize risk to humans. For example, the bait station may be designed so it is not readily accessible by people, the area may be posted with warning signs, and the bait station may be monitored when in use.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in the EA, concluded low risks to humans (USDA 1997, revised, Appendix P).

The human risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to present a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. This adverse impact to human health and safety from raven removal is expected to be negligible to none.

There should be indirect beneficial impacts to human health and safety from the reduction in human subsidies of food and water. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. This beneficial impact to human health and safety would be negligible.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.6 Effectiveness/Conclusion

The effectiveness of the program can be defined in terms of the increase in the number of hatchling and juvenile desert tortoises in the population and the numbers recruited into the adult population over time. Effectiveness can also be determined by the reduction in the number of common raven nest sites, with evidence of desert tortoise shell remains near them. With respect to removal of common ravens, the wildlife specialist must be able to complete wildlife damage management expeditiously, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting nontarget predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purpose and objectives of the proposed action. Data were used from McIntyre et al. (2006) on the number of nests or raven pairs preying on desert tortoises annually, for those portions of the California desert that were surveyed. In addition, information was applied on the reproductive needs and behavior of the common raven. The result was that approximately 27 nests or pairs of common ravens would have desert tortoise remains under their nests in a year. From these data, the number of nests or pairs of ravens throughout the California desert that likely prey on juvenile and hatchling desert tortoises, or 100 nests or pairs of common ravens were extrapolated. Therefore, if 100 pairs of common ravens that prey on the desert tortoise were removed, this action would eliminate most of the predation on juvenile and hatchling desert

tortoises by breeding common ravens in the California desert. The removal of common ravens should yield both immediate relief to hatchling and juvenile desert tortoises from common raven predation and allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. This immediate relief is especially critical for the west Mojave population of the desert tortoise, where populations continue to decline with little to no evidence of juvenile of hatchling animals in the population. This alternative would remove only those common ravens with evidence of predation or attempted predation on desert tortoises; the other ravens in the population would not be removed.

The implementation of the "cultural and physical" based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator in balance with the populations of other desert animals. As the common raven population and associated predation pressure on the desert tortoise declines, the level of common raven removal would also decline. Even with the proposed reductions, the population numbers for the common raven would remain above historic levels in the California desert and would not affect the sustainability of the population in the California desert.

4.4 Alternative C–Integrated Predator Management and Removal of Ravens within Desert Tortoise Management Areas

4.4.1 Impact on the Target Species (Common Raven) Population

The direct impacts of this alternative would be greater than that of Alternative B, but still have only minimal adverse impacts to the common raven population in the short- and long-term. The impacts would be greater as approximately 2,000 common ravens or 5.3 percent of the California desert population of ravens would be removed annually at the DTMAs. The number of common ravens removed would depend on several variables: effectiveness of methods to reduce human subsidies of food, water, and nest and roost sites to the common raven, availability of staff, and funding. The wildlife specialist would determine which removal strategy or strategies would be most effective for the removal of the common raven from these areas.

While the number of common ravens removed from trapping, shooting and using an avian toxicant would likely result initially in decreased raven densities within each of the DTMAs, it would not remove ravens from other areas of the California desert such as private lands, state lands outside of DTMAs, many wilderness areas, and some BLM and NPS lands. Common raven population numbers would remain well above the historic levels of ravens for the California desert. We do not anticipate this removal to adversely affect the short- or long-term survivability and sustainability of the common raven or to reduce raven population numbers significantly throughout the desert region of California. Movement of common ravens from adjacent populations into the California desert would still occur.

This alternative would remove up to 2,000 common ravens annually from the DTMAs. Recent data (McIntyre 2006) show that about 5 percent of the common raven nests surveyed in portions of the California desert had evidence of desert tortoise predation under the nests. We anticipate that the removal of 2,000 common ravens annually would result in an increase in the raven population in the California desert. Between 1966 and 1999, ravens in the Mohave Desert

had an annual population increase of 5.4 percent and 7.1 percent in the Colorado Desert (Liebezeit et al. 2002).

The indirect impacts from implementation of the actions to reduce human subsidies of food, water, nest sites, and roost sites and remove unoccupied raven nests would be similar to those of Alternative B.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.2 Impact on Nontarget Species

4.4.2.1 Desert Tortoise

The indirect impacts from implementing Alternative C to the desert tortoise would be similar to that of Alternative B, moderate and beneficial. The increased number of common ravens removed from DTMAs would likely lead to an immediate beneficial effect in these locations by reducing all ravens that prey in these essential DTMAs. The reduction of ravens preying on desert tortoises in the DTMAs would allow hatchling and juvenile desert tortoises in these areas to survive, thus increasing the desert tortoise population. It would also allow more desert tortoises to reach adulthood and reproduce, thus contributing to the recovery of the species.

The other part of the alternative, to reduce human subsidies of food, water, nest and roosting sites for the common raven, and to remove unoccupied nests of common ravens would have the same indirect impacts as that in Alternative B. The reduction in human subsidies would eventually reduce common raven population numbers and raven predation on desert tortoises throughout the California desert, thereby increasing desert tortoise population numbers.

Another indirect impact is that desert tortoises may be injured or killed by vehicles carrying project employees. This impact would be similar to that described in Alternative B although the number of employees and vehicle trips would likely be greater. Although we estimate up to a 50 percent increase in number of miles traveled, we consider this risk negligible because of the mitigation measures. The likelihood of this adverse impact occurring is negligible; therefore, the impact is negligible.

4.4.2.2 Other Wildlife Species

This alternative would have similar indirect impacts to other wildlife species as Alternative B. Wildlife species that are prey for the common raven and located within the DTMAs. would experience minor to moderate beneficial impacts with the reduction in numbers of common ravens that prey on these wildlife species. The impacts from implementation of Alternative C for raven removal, reduction of human subsidies, and removal of unoccupied common raven nests would be similar to that of Alternative B although the geographic extent of this impact would be greater.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.3 Impact on Socioeconomic Issues

The indirect impacts to socioeconomic issues from raven removal and reduction in human subsidies would be similar to those of Alternative B. The efforts to remove (shoot, trap and euthanize, and use an avian toxicant) ravens would cover the DTMAs ,which are large blocks of area located throughout much of the California desert, rather than being scattered throughout. Occasionally these activities would occur near communities. If they do, their effects would be limited in duration. For example, shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed including discharge of firearms near dwellings. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities; these activities would occur in the desert, not within communities or settlements. Implementation of these actions would result in negligible adverse impacts to socioeconomic issues.

Implementation of actions to remove common ravens would likely cost $400,000 per year and could occur at any time during the year. Qualified professionals from APHIS-WS would implement these removal methods. The impact of spending this amount in the economy of the California desert would be negligible and beneficial.

Part of Alternative C is to encourage and work with local cities, counties, and the public to implement existing ordinances and/or develop basic processes that manage the disposal and storage of solid waste, conserve water, and modify structures to reduce human subsidies of food, water, nest and roost sites for the common raven. Implementation of these programs would likely result in minimal changes in human lifestyles, and costs. The public would be informed about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions. They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions and would result in effective management of solid waste, water, and nest and roost sites that would reduce the common raven population. This portion of Alternative C should have negligible beneficial impacts on socioeconomic issues.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities are available for various forms of recreation on lands managed by the BLM, NPS, and California Department of Parks and Recreation. Implementation of Alternative C would not affect the continuation of these recreation opportunities.

Implementation of common raven removal and reduction in human subsidies to ravens would indirectly impact recreation in the California desert and would have similar impacts to

Alternative B. At removal locations for the common raven, consideration would be given to public activity patterns in the DTMAs. Most public recreation occurs on weekends and holidays. The USFWS and APHIS-WS would consult with the BLM, NPS, California Department of Parks and Recreation, and CDFG to minimize impacts of raven removal on scheduled recreational activities. At sites where people are likely to be exposed to raven removal activities, emphasis would be placed on education and using tools that would not potentially harm the public. These impacts would be adverse and negligible.

The cleanup of illegal dumpsites and similar activities may detract from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup.

Effective implementation of this alternative would over time result in greater opportunities for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.5 Impact on Human Health and Safety

The implementation of this alternative would have similar indirect impacts as Alternative B. If removal efforts are conducted in the DTMAs, the effects to human health and safety would be unlikely, as DTMAs contain few communities or settlements. Measures to avoid adverse impacts to human health and safety are included in the proposed action through use of the Wildlife Services Decision Model (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety are listed in Section 3.2.2 of the Wildlife Services EIS. Many of the procedures intended to minimize impacts on recreation would also minimize risks to human health and safety.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in this EA concluded low risks to humans (USDA 1997, revised, Appendix P). The risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to present a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. Therefore, the impact to human health and safety from common raven removal is expected to be negligible and adverse.

The reduction in human subsidies to the common raven would have indirect impacts on human health and safety. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the

spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. There should be negligible beneficial impacts to human health and safety from the reduction in human subsidies of food, water, nest sites, and roost sites for the common raven.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.6 Effectiveness/Conclusion

The effectiveness of the program in relation to accomplishing the purpose and objectives of the proposed action can be defined as the increase in number of hatchling and juvenile desert tortoises that comprise the population in the DTMAs, and the numbers over time that are recruited into the adult population in these areas. Effectiveness can also be determined by the reduction in the number of common raven nest sites with evidence of desert tortoise shell remains near them in the DTMAs. Since this alternative would result in the removal of all ravens in the DTMAs in the California desert, raven removal coupled with reduction in human subsidies would provide a greater level of effectiveness in accomplishing the purpose and objectives of the proposed action in these areas. It would also remove ravens that may not be preying on desert tortoises.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purpose and objectives of the proposed action. The removal of common ravens that may, or may not prey on desert tortoises, should yield both immediate relief from raven predation on hatchling and juvenile desert tortoises in the DTMAs and allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population in these areas. It would provide little relief to those areas outside the DTMAs. The implementation of the "cultural and physical" based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator in balance with the populations of other desert animals. Population numbers for the common raven would remain above historic levels in the California desert.

With respect to removal of common ravens in the DTMAs, the wildlife specialist must be able to complete wildlife damage management expeditiously and thoroughly, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting target predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective. The effectiveness of methods used, given they are used by trained professionals, would influence the overall effectiveness of this alternative.

4.5 Alternative D–Integrated Predator Management and Removal of Ravens within Desert Tortoise Management Areas and Raven Concentration Areas

4.5.1 Impact on the Target Species (Common Raven) Population

The direct impacts of this alternative would be similar to, but greater than, that of Alternatives B or C, but would still have minor adverse impacts to the common raven population in the California desert in the short- and long-term. The impacts would be greater as approximately 3,000 to 7,000 common ravens or 8 to 18.7 percent of the California desert population of ravens would be removed annually at the DTMAs and concentration areas. The number of common ravens removed would depend on several variables: effectiveness of implementing methods to reduce human subsidies of food, water, and nest and roost sites to the common raven; availability of staff; and funding. The wildlife specialist would determine which removal strategy or strategies would be most effective for removal of the common raven for these areas.

The number of common ravens removed using trapping, shooting, and avian toxicant methods would result in decreased raven densities within the DTMAs and concentration sites. We would not remove ravens from other areas in the California desert such as most private lands, many military installations, state lands outside DTMAs, and some BLM and NPS lands including many wilderness areas. There would be removal of unoccupied raven nests. We anticipate that the removal of 3,000 to 7,000 common ravens annually would result in a slight decrease in the raven population in the California desert. Between 1966 and 1999, ravens in the Mohave Desert had an annual population increase of 5.4 percent and 7.1 percent in the Colorado Desert (Liebezeit et al. 2002). Raven population numbers would remain well above historic levels in the California desert. We do not anticipate that implementation of this alternative would reach the threshold of reducing the common raven in the California desert to a level below self-sustaining (see Table 4-1). Movement of common ravens from adjacent populations into the California desert would still occur.

The indirect impacts from implementation of the actions to reduce human subsidies of food, water, and nest and roost sites and remove unoccupied raven nests would be similar to those of Alternative B.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1. However, a minor portion of the population in the California desert would be removed annually.

4.5.2 Impact on Nontarget Species

4.5.2.1 Desert Tortoise

The indirect impacts from implementing Alternative D to the desert tortoise would be similar to Alternative C. The increased number of common ravens removed from the DTMAs and raven concentration sites would lead to a greater immediate beneficial effect than Alternative C. This would occur by removing both ravens that prey and do not prey on desert tortoises in these DTMAs, which are essential for desert tortoise survival and recovery, and reducing the concentrated numbers of potential predatory ravens in desert tortoise habitat near these concentration sites. Raven removal would allow hatchling and juvenile desert tortoises in these

and nearby areas to survive and contribute to increased desert tortoise populations. Implementation of this alternative would also allow more desert tortoises to reach adulthood and reproduce, contributing to the recovery of the species.

The other part of Alternative D, reduce human subsidies of food, water, and nest and roost site for the common raven, would have the same impact at Alternative B. The reduction in human subsidies would eventually reduce raven population numbers and raven predation on desert tortoises, thereby increasing desert tortoise population numbers. These impacts would be moderate and beneficial.

A potential negative impact of this alternative is minimal but possible. Desert tortoises may be injured or killed by vehicles carrying project employees. This possibility would be minimized or eliminated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on desert tortoise awareness. Although we estimate up to a 100 percent increase in number of miles traveled above the Alternative B miles, we consider the risk negligible because of the mitigation measures.

4.5.2.2 Other Wildlife Species

The indirect impacts of implementing this alternative would be similar to those of Alternative C. This alternative would have minor to moderate beneficial impacts to wildlife species that are prey for the common raven in the DTMAs and concentration sites. The impacts from implementing Alternative D for raven removal, reduction of human subsidies, and removal of unoccupied raven nests would be similar to that of Alternative C although the geographic area of this impact would be greater as it includes raven concentration areas.

The potential removal methods (trapping and relocation, shooting, trapping and euthanasia, and poisoning) are not likely to affect nontarget species. The actual raven removal effort is not expected to affect other wildlife species.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.3 Impact on Socioeconomics Issues

The indirect impacts to socioeconomic issues from implementing Alternative D would be similar to Alternative C. The efforts to remove (shoot, trap and euthanize, and use an avian toxicant) ravens would cover a larger area than Alternative C and occur in defined blocks or polygons located throughout the California desert. Occasionally these activities may occur near communities. If they do, their effects would be limited, and should have negligible adverse impacts on socioeconomics. Shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed including discharge of firearms near dwellings. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities; these activities would occur in the desert, not within communities or settlements. We estimate that implementation of these removal actions would cost $550,000 per year and could occur at any time during the year. Qualified professionals from APHIS-WS would

implement these removal methods. Implementation of these actions would result in negligible adverse impacts to socioeconomic issues.

Part of Alternative D is to work with federal, state, and local agencies, and the public to develop and/or implement existing authorities and develop basic processes that manage the disposal and storage of solid waste; conserve water; and modify structures to reduce human subsidies of food, water, and nest and roost sites for the common raven in the California desert. Implementation of these programs would likely result in minimal changes in human lifestyles and costs. We would inform the public about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions. They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions and would result in effective management of solid waste, water, and nest and roost sites that would reduce the common raven population. This portion of Alternative D should have negligible beneficial impacts on socioeconomic issues.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities are available for various forms of recreation on lands managed by the BLM, NPS, and California Department of Parks and Recreation. Implementation of Alternative D would not affect the continuation of these recreation opportunities.

The indirect impacts to recreation from implementation of Alternative D would be similar to Alternative C. At common raven removal locations (DTMAs and concentration sites), consideration would be given to public recreation activity patterns in these areas. Most public recreation occurs on weekends and holidays. The USFWS and APHIS-WS would consult with the BLM, NPS, California Department of Parks and Recreation, and CDFG to minimize impacts of raven removal on scheduled recreational activities. At sites where people are likely to be exposed to raven removal activities, emphasis would be placed on education and using tools that would not potentially harm the public. This impact would be negligible and adverse.

The cleanup of illegal dumpsites and similar activities may detract from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup.

Effective implementation of this alternative would result in greater opportunities over time for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.5 Impact on Human Health and Safety

The indirect impact to human health and safety from implementation of Alternative D would be similar to Alternative C. Measures to avoid adverse impacts on human health and safety are built into this alternative through use of the Wildlife Services Decision Model (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety is listed in Section 3.1.2 of the Wildlife Services EIS. Many of the procedures intended to minimize impacts on recreation would also minimize or avoid risks to human health and safety.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in this EA concluded low risks to humans (USDA 1997, revised, Appendix P). The risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to represent a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. Therefore, the impact to human health and safety from common raven removal is expected to be negligible and adverse.

The reduction in human subsidies to the common raven would have indirect impacts on human health and safety. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. There should be negligible beneficial impacts to human health and safety from the reduction in human subsidies of food, water, nest sites, and roost sites for the common raven.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.6 Effectiveness/Conclusion

The effectiveness of the program in relation to accomplishing the purpose and objectives of the proposed action can be defined as the increase in number of hatchling and juvenile desert tortoises that comprise the population in the DTMAs and areas adjacent to raven concentration areas, and the numbers recruited into the adult population over time in these areas. Effectiveness can also be determined by the reduction in the number of common raven nest sites with evidence of desert tortoise shell remains near them in the DTMAs. Because this alternative would result in the greatest number of common ravens removed in the California desert, many of which may not prey on the desert tortoise, raven removal coupled with reduction in human subsidies and nest removal would provide a similar level of effectiveness in accomplishing the purpose and objectives of the proposed action.

With respect to removal of common ravens in the DTMAs and concentration areas, the wildlife specialist must be able to complete wildlife damage management expeditiously and thoroughly, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that the APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting target predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective. The effectiveness of methods used, given they are used by trained professionals, would influence the overall effectiveness of this alternative.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purposes and objectives of the proposed action. The removal of common ravens should yield both immediate relief from raven predation on hatchling and juvenile desert tortoises in the DTMAs and areas adjacent to raven concentration sites. It would allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. The implementation of the "cultural and physical" based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator in balance with the populations of other desert animals. Population numbers for the common raven would remain above historic levels in the California desert.

4.6 Alternative E–Integrated Predator Management Using only Cultural and Physical Methods

4.6.1 Impact on the Target Species (Common Raven) Population

Alternative E would have indirect impacts to the common raven that are similar to those of Alternative B for implementation of cultural and physical methods. Alternative E should have negligible impacts to the common raven population in the short-term. Currently several federal agencies have implemented limited efforts to reduce human subsidies of food, water, and nest and roost sites on federal lands. These efforts would be expanded and integrated across the California desert to gradually reduce the population of common ravens in the California desert.

The long-term "cultural and physical" efforts of reducing human subsidies would result in a gradual reduction of the common raven population in the California desert. The impact of this reduction would be minimal and adverse. The effectiveness of this alternative would depend on the cooperation of federal, state, and local agencies and the public in implementing measures to reduce human subsidies of food, water, and nest and roosts sites for the common raven in the California desert. If this alternative is not implemented completely, the common raven population would continue to increase in the California desert.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.2 Impact on Nontarget Species

4.6.2.1 Desert Tortoise

Because this alternative does not remove any ravens, we anticipate a slowly developing, long-term beneficial impact to desert tortoises that are hunted by the common raven. Until the cultural and physical efforts are fully implemented, we anticipate the population of the desert tortoise to continue to decline. Eventually, the removal of raven nests and increased actions to reduce anthropogenic subsidies (including food, water, and nest and roost sites) would benefit the desert tortoise, but these benefits to the desert tortoise population would not likely occur for several years. Sustained levels of predation by the common raven would likely continue for several years until the cultural and physical efforts were fully implemented by the agencies and the public. For the desert tortoise in the California desert, particularly in the west Mojave Desert, this gradual implementation of cultural and physical efforts and delayed reduction in predation may not be in time to prevent the status of the desert tortoise in California from declining to that of endangered.

4.6.2.2 Other Wildlife Species

Because this alternative does not remove any ravens, we would anticipate a slowly developing, long-term beneficial impact to other wildlife species that are hunted by the common raven. Beneficial impacts would likely occur to birds, reptiles, and small mammals. As ravens are known to be omnivorous, a reduction in their numbers in certain areas would reduce predation on species including, but not limited to: small birds (eggs, nestlings, and adults), eggs, and nestlings of most birds nesting in the desert, snakes, lizards, rodents, and lagomorphs (rabbits and hares). In some specific portions of the project area, minimal benefits to animals would also affect declining, sensitive populations and in a few specific instances (Mohave ground squirrel, and Coachella Valley fringe-toed lizard), listed and/or candidate species would be positively impacted by actions proposed under this plan. Concentrations of common ravens occur near the Edom Hill landfill, an area adjacent to Coachella Valley fringe-toed lizard habitat.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.3 Impact on Socioeconomics Issues

An integrated effort (using cultural and physical methods) to reduce human subsidies, such as food and water, to the common raven would be expected to result in negligible changes to human lifestyle. The current cleanup of illegal dumps has had no impact on the lifestyle of the human population in the California desert. Efforts to reduce standing water on some lands would likely result in no effect to human lifestyle and a negligible beneficial effect from reduction in water costs.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.4 Impact on Recreation

Under Alternative E, activities would be conducted in desert tortoise habitat with the exception of cleanup of illegal dumps. These sites are usually small and located near

communities. The cleanup activities may deter from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup and negligible beneficial effects afterward.

Effective implementation of this alternative would over time result in greater opportunities for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.5 Impact on Human Health and Safety

Some of the "cultural and physical" measures would provide limited improvement to human health and safety. These include removal of illegal dumps, better management of transfer stations, and eliminating standing water. Illegal dumps may contain hazardous materials. Since they are usually easily accessible, the public is at risk of exposure to these hazards. They also contain debris, which can cause injury or death to anyone inspecting or playing at a dumpsite.

Standing water in a warm environment is a breeding habitat for mosquitoes that carry diseases. Encouraging agencies and the public to manage their outside watering to eliminate standing water which subsidizes the common raven would also reduce the likelihood of mosquitoes breeding and carrying diseases to humans. Implementation of this alternative would have a negligible beneficial impact on human health and safety.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.6 Effectiveness/Conclusion

Based on the description of the Need for Action, a "cultural and physical" based program would be expected to slowly reduce mortality and increased recruitment for the desert tortoise after a period of implementation of the program to manage the common raven populations. Alternative E would not be as effective initially or in the long-term as Alternatives B, C, or D. It would not allow for the immediate removal of common ravens known to prey or that may prey on hatchling and juvenile desert tortoises. It would not provide an environment for the survival of hatchling and juvenile desert tortoises in a timely manner. It would not contribute to the recruitment of young animals into the adult population or the survival of the next generation. Elevated levels of predation by the common raven on the desert tortoise would continue for at least the current life span of an adult raven (13 years in the wild) or longer. Ravens that prey on the desert tortoise would remain in the population; other ravens would learn from them how to prey on desert tortoises. This behavioral cycle would continue for the current number of ravens although over time it would eventually be less. There would be no immediate relief to allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. This time lag in providing relief from juvenile and hatchling mortality would continue the current one to two decade long period with little or no

survival and recruitment of these hatchling and juvenile desert tortoises, especially in the west Mojave Desert, and could eventually result in local or regional extinction. Even with a large-scale outreach program to the federal, state, local agencies, and the public to reduce human subsidies to the common raven, ravens would continue to prey on hatchling and juvenile desert tortoises at a rate greater than historic levels and at a rate greater than the current population can endure. It would likely take several decades after full implementation of the "cultural and physical" based program to meet the purpose and objectives of the proposed action. Given the continued long-term decline of the population of the desert tortoise, such a delay in achieving any measure of success substantially diminishes the potential benefits to the desert tortoise populations.

With respect to determining whether the impacts to the resource areas rise to the level of significance for the alternatives, see Table 4-1. None of the alternatives considered would cause mortality or permanent habitat loss for listed or candidate species or other protected species. Alternative D does remove the largest percentage of the common raven population; however, the remaining population would remain at historically high levels in the California desert.

The socioeconomic impacts of the alternatives analyzed would be well below the 10 percent criteria for significance. None of the alternatives would likely stimulate local area growth rates or change employment levels.

The impacts to recreation from implementation of the alternatives would not prevent the continuation of existing authorized off-highway vehicle recreation use or continuation of existing hunting programs. The availability of any recreation resource would not be increased or decrease by 10 percent or more.

None of the alternatives would expose people to potential health hazards. All are consistent with existing health and safety regulations.

4.7 Alternative F–Phased Implementation of Integrated Predator Management and Removal of Ravens Using a Phased Implementation, as Needed (Alternatives B, C, and D)

4.7.1 Impact on the Target Species (Common Raven) Population

The direct impacts of this alternative would be similar to that of Alternatives B, C, and D, with the greatest degree of impact occurring if Alternative D is implemented. The short- and long-term impacts to the common raven population in the California desert would range from negligible adverse from implementation of Alternative B to minor adverse impacts from implementation of Alternative D. The estimated percent of the population of common ravens that would be removed would range from 0.5 percent from implementation of Alternative B to about 19 percent from implementation of Alternative D. The number of common ravens removed would depend on several variables: effectiveness of implementing methods to reduce human subsidies of food, water, and nest and roost sites to the common raven; availability of staff; and funding. The wildlife specialist would determine which removal strategy or strategies would be most effective for removal of the common raven for these areas. See sections 4.3.1, 4.4.1, and 4.5.1 above for a description of impacts from implementation of this phased approach.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1. However, a minor portion of the population in the California desert would be removed annually.

4.7.2 Impact on Nontarget Species

4.7.2.1 Desert Tortoise

The indirect impacts from implementing Alternative F to the desert tortoise would be similar to Alternatives B, C, and D. The increased number of common ravens removed from the DTMAs and raven concentration sites would lead to a greater immediate beneficial effect than Alternative C. This would occur by removing both ravens that prey and do not prey on desert tortoises in these DTMAs, which are essential for desert tortoise survival and recovery, and reducing the concentrated numbers of potential predatory ravens in desert tortoise habitat near these concentration sites. Raven removal would allow hatchling and juvenile desert tortoises in these and nearby areas to survive and contribute to increased desert tortoise populations. Implementation of this alternative would also allow more desert tortoises to reach adulthood and reproduce, contributing to the recovery of the species.

The other part of Alternative F, reduce human subsidies of food, water, and nest and roost site for the common raven, would have the same impact as Alternatives B, C, and D. The reduction in human subsidies would eventually reduce raven population numbers and raven predation on desert tortoises, thereby increasing desert tortoise population numbers. These impacts would be moderate and beneficial.

A potential negative impact of this alternative is minimal but possible. Desert tortoises may be injured or killed by vehicles carrying project employees. This possibility would be minimized or eliminated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on desert tortoise awareness. We consider the risk negligible because of the mitigation measures.

4.7.2.2 Other Wildlife Species

The greatest indirect impacts of implementing this alternative would be similar to those of Alternative D. This alternative would have minor to moderate beneficial impacts to wildlife species that are prey for the common raven in the DTMAs and concentration sites. The impacts from implementing Alternative F for raven removal, reduction of human subsidies, and removal of unoccupied raven nests would be similar to that of Alternative D although the geographic area of this impact would be greater as it includes raven concentration areas.

The potential removal methods (trapping and relocation, shooting, trapping and euthanasia, and poisoning) are not likely to affect nontarget species. The actual raven removal effort is not expected to affect other wildlife species.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.3 Impact on Socioeconomics Issues

The greatest indirect impacts to socioeconomic issues from implementing Alternative F would be similar to Alternatives D. The efforts to remove (shoot, trap and euthanize, and use an avian toxicant) ravens would cover a larger area than Alternative C and occur in defined blocks or polygons located throughout the California desert. Occasionally these activities may occur near communities. If they do, their effects would be limited, and should have negligible adverse impacts on socioeconomics. Shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed including discharge of firearms near dwellings. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities; these activities would occur in the desert, not within communities or settlements. We estimate that implementation of these removal actions would cost $550,000 per year and could occur at any time during the year. Qualified professionals from APHIS-WS would implement these removal methods. Implementation of these actions would result in negligible adverse impacts to socioeconomic issues.

Part of Alternative F is to work with federal, state, and local agencies, and the public to develop and/or implement existing authorities and develop basic processes that manage the disposal and storage of solid waste; conserve water; and modify structures to reduce human subsidies of food, water, and nest and roost sites for the common raven in the California desert. Implementation of these programs would likely result in minimal changes in human lifestyles and costs. We would inform the public about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions. They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions and would result in effective management of solid waste, water, and nest and roost sites that would reduce the common raven population. This portion of Alternative F should have negligible beneficial impacts on socioeconomic issues.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities are available for various forms of recreation on lands managed by the BLM, NPS, and California Department of Parks and Recreation. Implementation of Alternative F would not affect the continuation of these recreation opportunities.

The greatest indirect impacts to recreation from implementation of Alternative F would be similar to Alternative D. At common raven removal locations (DTMAs and concentration sites), consideration would be given to public recreation activity patterns in these areas. Most public recreation occurs on weekends and holidays. The USFWS and APHIS-WS would consult with

the BLM, NPS, California Department of Parks and Recreation, and CDFG to minimize impacts of raven removal on scheduled recreational activities. At sites where people are likely to be exposed to raven removal activities, emphasis would be placed on education and using tools that would not potentially harm the public. This impact would be negligible and adverse.

The cleanup of illegal dumpsites and similar activities may detract from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup.

Effective implementation of this alternative would result in greater opportunities over time for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.5 Impact on Human Health and Safety

The indirect impact to human health and safety from implementation of Alternative F would be similar to Alternative D. Measures to avoid adverse impacts on human health and safety are built into this alternative through use of the Wildlife Services Decision Model (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety is listed in Section 3.1.2 of the Wildlife Services EIS. Many of the procedures intended to minimize impacts on recreation would also minimize or avoid risks to human health and safety.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in this EA concluded low risks to humans (USDA 1997, revised, Appendix P). The risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to represent a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. Therefore, the impact to human health and safety from common raven removal is expected to be negligible and adverse.

The reduction in human subsidies to the common raven would have indirect impacts on human health and safety. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. There should be negligible beneficial impacts to human health and safety from the reduction in human subsidies of food, water, nest sites, and roost sites for the common raven.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.6 Effectiveness/Conclusion

The effectiveness of the program in relation to accomplishing the purpose and objectives of the proposed action can be defined as the increase in number of hatchling and juvenile desert tortoises that comprise the population in the DTMAs and areas adjacent to common raven concentration areas, and the numbers recruited into the adult population over time in these areas. Effectiveness can also be determined by the reduction in the number of common raven nest sites with evidence of desert tortoise shell remains near them in the DTMAs. Since this alternative would result in the greatest number of common ravens removed in the California desert, many of which may not prey on the desert tortoise, raven removal coupled with reduction in human subsidies and nest removal would provide a similar level of effectiveness in accomplishing the purpose and objectives of the proposed action.

With respect to removal of common ravens in the DTMAs and concentration areas, the wildlife specialist must be able to complete wildlife damage management expeditiously and thoroughly, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that the APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting target predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective. The effectiveness of methods used, given they are used by trained professionals, would influence the overall effectiveness of this alternative.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purposes and objectives of the proposed action. The removal of common ravens should yield both immediate relief from common raven predation on hatchling and juvenile desert tortoises in the DTMAs and areas adjacent to raven concentration sites. It would allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. The implementation of the "cultural and physical" based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator more in balance with the populations of other desert animals. Population numbers for the common raven would remain above historic levels in the California desert. The implementation of a phased approach would provide the optimum ability to reduce common raven predation on the desert tortoise as needed while minimizing the number of ravens that need to be removed.

4.8 Selection of the Preferred Alternative

Based on the analysis of impacts for the six alternatives, we have selected Alternative F, implementation of a phased approach of Alternatives B, C, and D. Of the alternatives presented,

this alternative would implement the proposed action to reduce predation to the desert tortoise immediately (common raven removal) and for the long-term (implementation of the "cultural and physical based program"). It would provide the flexibility needed to adjust management actions to minimize the removal of the common raven and effectively reduce predation on the desert tortoise by the common raven.

4.9 Irreversible and Irretrievable Commitment of Resources

The resources involved with the proposed action include socioeconomics, recreation, common ravens, and nontargeted wildlife species. The maximum commitment of resources and manpower would be: for socioeconomics, the expenditure of up to $550,000 per year and employment of the equivalent of 1.25 full-time positions per year; for recreation, the loss of up to a total of 20 days per year at limited local sites; and for common ravens, the removal of up to 7,000 birds per year. Nontargeted species would experience a positive impact from reduced raven predation.

By implementing the proposed action, the only irreversible and irretrievable commitment of resources would be the removal of up to 7,000 common ravens annually. This would still leave the population at an historic high level.

4.10 Cumulative Impacts

This section of this EA analyzes cumulative impacts associated with the proposed action in the context of other "past, present, and reasonably foreseeable" action in the California desert. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In analyzing the specific impacts of the alternatives considered to implement the proposed action, the following cumulative analyses were identified. The identified impacts were analyzed in accordance with NEPA (42 USC 4321–4347), Council on Environmental Quality (CEQ) regulation (40 CFR Parts 1500–1508) and CEQ guidelines for conducting cumulative impact analysis (*Considering Cumulative Effects under the National Environmental Policy Act, Executive Office of the President*, January 1997).

4.10.1 Council on Environmental Quality Guidelines

The 1997 CEQ guidelines clarify NEPA requirements for cumulative impact analysis, focusing on issues affected by the proposed action and using resource-based analyses as opposed to activity-based analyses. The recommended CEQ methodology identifies and analyzes other past and present projects and forecasts for future actions that have affected (or will affect) resource or issues in the region. In addition, the 1999 EPA guidance on cumulative impact analysis, as well as the FWS guidance on analyzing threats to endangered species, were utilized in the analysis of the cumulative impacts.

Table 4-3 presents the resources analyzed based on CEQ guidelines and the three levels of analysis performed. Level 1 reflects resources (or issues) that did not have any potential cumulative effects concerns, thus no further analyses were needed. Level 2 analyses were conducted for those resources (or issues) that might be subject to potential cumulative effects. Level 3 analyses were conducted for those resources (or issues) that were identified as having cumulative effects resulting from direct and indirect effects of the potential actions and other

past, present, or future actions. Level 3 analyses included a more in-depth review of the combined effects on specific relevant topics within the given resource (or issue).

The impacts to socioeconomics, human health and safety, and recreation from implementation of each of the six alternatives would be negligible to none (Table 4-4). We considered/analyzed this level of impact for these resource issues and did not carry them forward for further discussion/analysis in the Cumulative Impacts section.

Table 4-5 presents the Level 3 analysis as it relates to the common ravens and other wildlife species.

Other than the alternatives proposed in this document, we are unaware of any past, current, or planned future actions that would directly or indirectly impact the common raven with one exception, the BLM's effort about 15 to 20 years ago to remove common ravens. Future actions that may impact the common raven would be continued human development throughout various locations in the California desert. These future actions are beneficial to the common raven and would likely contribute to higher common raven population numbers and increased predation pressure on the desert tortoise and other wildlife species.

Cumulative impacts for the common raven were discussed under Environmental Consequences Section. The worst-case scenarios discussed previously indicate that all alternatives would have minimal or minor cumulative impacts on the common raven population. Since the common raven is a resident bird in the California desert, removal efforts outside the California desert should have little effect on the common raven population in the California desert.

Cumulative impacts on nontarget species are also expected to range from moderate adverse to moderate beneficial. Implementation of the four action alternatives presented in this EA would likely have no to minimal adverse effects on the federal and state threatened desert tortoise and moderate beneficial effects. Actions that are effective in reducing raven predation on the desert tortoise would benefit this species. For other wildlife species, the implementation of the four action alternatives would likely have no to minimal adverse effects and moderate beneficial effects. Actions that are effective in reducing the number of ravens in the California desert would likely benefit these species of small mammals, birds, and reptiles from reduced rates of predation.

4.10.1.1 Comparison of Alternatives under CEQ Guidelines

4.10.1.1.1 Alternative A

Under Alternative A, the current program alternative, the common raven populations would be expected to continue to increase. With larger raven populations, we would expect increased predation of juvenile desert tortoises causing a lesser likelihood of desert tortoise recovery. Without substantially reducing hatchling and juvenile desert tortoise mortality and increasing desert tortoise recruitment, it would be impossible for desert tortoise populations to recover. The current program alternative would continue the status quo in the California desert, which is a continued decline of desert tortoise densities and reduction of its geographic range especially in the Western Mojave Recovery Unit. Without an integrated approach to desert tortoise recovery, including a reduction in predation, the long-term cumulative impact is anticipated to be a

continued decline of the desert tortoise populations and other wildlife species in the California deserts and extirpation of the desert tortoise in some locations.

The cumulative impact of implementation of the current outreach program by the Defenders of Wildlife would be limited. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies about what they can do to reduce human subsidies of food, water, and nest and roost sites for the common raven thereby increasing hatchling and juvenile desert tortoise survival and recruitment. Because of the current limited size of this program, we anticipate minimal adverse impacts to ravens as they would continue to expand in numbers and geographic area following human development in the California desert.

Table 4-3. Level of Analysis for Each Resource Area

Level 1 No Impacts Identified	Level 2 Analysis and Discussion	Level 3 Detailed Analysis
Air Quality	Socioeconomics	Target Species (common raven)
Geology	Recreation	Nontarget Species (desert tortoise and other wildlife species)
Soils	Human Health and Safety	
Floodplains		
Wetlands		
Vegetation		
Aquatic Resources		
Unique Ecosystems		
Park Lands		
Natural or Depletable Resources		
Traffic		
Noise		
Cultural Resources		
Indian Trust Resources		
Urban Quality		
Seismicity		
Environmental Justice		
Protection of Children from Environmental Health and Safety Risks		
Prime and Unique Resources (farmlands)		
Geological Resources (rocks and streambeds)		
Biodiversity and Ecosystems		
Stream Flow Characteristics		
Energy Requirements and Conservation		
Water Quantity		
Minerals		
Ecologically Critical Areas		
Visual Quality		
Sacred Sites		
Wilderness		

Table 4-4. Analysis of Socioeconomics, Recreation, and Human Health and Safety

Socioeconomic Resources **Quick Look Questions**
No **Has** the project area undergone any major changes in economic activity or population in the last 10 years as a result of actions similar to the proposed action? *While the California desert has experienced major growth in economic activity and population size, this growth is not the substantial result of similar types of projects. More than 15 years ago, the BLM proposed and implemented for several days a raven management plan. This action would have contributed a negligible amount of socioeconomic activity in the project area.* **No** **Will the** proposed action contribute to this major growth in economic activity and population size? *The California desert has a million plus population size and economic activity and value in the hundreds of millions of dollars. The proposed action would contribute a few seasonal positions annually to the economy and no contribution to the population.* **No** Is **additional** cumulative effects analysis needed?
Human Health and Safety **Quick Look Questions**
Yes Are **there** any known or suspected contaminated sites that would be affected by the proposed action? *Part of the proposed action is to clean up illegal dumps.* **Yes** **Would** the proposed action increase the use of existing hazardous materials or involve the use of new hazardous materials? *We will use an avicide that will be administered by certified professionals in handling, use, and disposal of the avicide. Localized in application and used in small amounts* **Yes** **Are** there any potential health or safety risks to the public from the proposed action? *There are potential risks because of the use of firearms and an avicide. However, these methods would be implemented by qualified professionals who would select the most appropriate method including consideration of human activity in the use area* **No** Do **any** risks remain that cannot be mitigated? **No** Is **additional** cumulative effects analysis needed?

Table 4-4. Analysis of Socioeconomics, Recreation, and Human Health and Safety

Recreation **Quick Look Questions**
Yes Are there areas within the project area that are used for access and recreation? *Much of the California desert is used for a variety of types of recreation.* **No** **Does** the proposed action increase the potential for additional recreational activities? **Slight** Does the proposed action have the potential to limit recreational activities? *Proposed action would be limited to small areas for short period of time.* **Yes** Are **there** any limitations to recreation that cannot be mitigated? *There is the possibility that after implementing mitigation for recreation (e.g., considering scheduled recreation events and periods of higher use - weekends and holidays), some activities would occur that would limit recreation in a small area and for a short time. The rest of the California desert would be available for various types of recreation.* **No** Is a detailed cumulative effects analysis needed?

Table 4-5. Level 3 Analysis–Common ravens and Other Wildlife Species (Refer to Table 4-3)

No **Would** any of the alternatives result in significant changes (as defined under NEPA)?

No **Would** the proposed action result in the removal of listed species from the wild?

The proposed action would only result in the removal of the common raven which is not a federal or state-listed species.

Yes Has the project area been surveyed for listed species?

Yes Does **the** proposed action result in the removal from the wild of nonlisted species?

Yes **Will the proposed action take place on sensitive habitats?**

Locations may include desert tortoise critical habitat, BLM lands with special designation such as Areas of Critical Environmental Concern, and NPS lands.

Yes **Will** the proposed action take place near or in designated wilderness?

The proposed action may occur near wilderness but would not likely occur in designated wilderness. Most wilderness areas are mountainous areas and are not considered high quality habitat for the desert tortoise in California. However, if we implement the proposed action in wilderness areas, we would follow all applicable rules for wilderness areas.

Yes Does **the** proposed action involve the use of hazardous or toxic material in association with wildlife species?

An avian toxicant may be used to remove common ravens.

Yes **Are** any state or federal permits or authorization required for the proposed action?

Both state permits and federal authorization are required.

Yes Is **additional** cumulative impact analysis required?

We anticipate the cumulative impacts to socioeconomics, human health and safety, and recreation in the California desert to be negligible. The USFWS and other agencies would not be implementing actions that would create or remove jobs from the area and would not be implementing actions that would likely affect human health and safety or recreation.

4.10.1.1.2 Alternative B

The removal of 100 pairs of common ravens each year is not considered large enough to have a cumulative impact on ravens in the California desert or in the state as a whole. There are other raven depredation activities being conducted within the state and in adjacent states, primarily associated with damage to agricultural and livestock resources, and threats to human health and safety. However, none of these activities are in the California desert. Since the common raven in the California desert is a resident or nonmigratory animal, these depredation activities should not affect the ravens in the California desert. Population levels of the common raven from removal actions would decline but would be greater than they were in the 1960s, 1970s, 1980s, and 1990s.

This alternative would allow for a decrease in hatchling and juvenile desert tortoise mortality, which would provide a positive impact to the desert tortoise population, and would ultimately increase desert tortoise recruitment in the California desert. It would not eliminate predation by the common raven on the desert tortoise and would not eliminate ravens in any part of the California desert. This alternative would allow for enough of a decrease in hatchling and juvenile desert tortoise mortality to provide a positive impact for the desert tortoise. It would also provide a benefit to other wildlife species in the desert upon which the common raven preys by reducing the level of mortality from common raven predation.

The cumulative impact of implementation of a cultural and physical based program, which includes a public education and outreach program by the USFWS and cooperating agencies, would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies about what they can do to reduce human subsidies of food, water, nest sites, and roosts sites for the common raven. Over time, if these actions are fully implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be minimal. Only a handful of jobs would be created from implementation of this action, and those jobs would be seasonal. Compared to the tens of thousands of people and jobs that are in the California desert, this impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be none to negligible. Implementation would not expose people to potential health hazards. Use of firearms and avicide bait would be by trained professionals and limited to local sites away from communities. The egg bait would be on platforms high above the ground to keep small children from accessing the eggs. The platform would be signed with warnings in English and Spanish. Personnel would be nearby to monitor the avicide sites for human behavior. This alternative is consistent with existing health and safety regulations. Its

implementation would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may seasonally restrict the public from fully using a small number of sites. This action would also provide a benefit by increase wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal, state, and local agencies in their land management plans.

4.10.1.1.3 Alternative C

The removal of 2,000 adult ravens from the California desert annually is not considered large enough to lead to a cumulative negative impact on the common raven population in the California desert or throughout the state. We are unaware of any other raven removal or depredation activities currently planned or conducted in the California desert. There are other raven depredation activities being conducted within the state and in adjacent states, primarily associated with damage to agricultural and livestock resources, and threats to human health and safety. However, none of these activities are in the California desert. Since the common raven in the California desert is a resident or nonmigratory animal, these depredation activities would not affect the ravens in the California desert. Population levels of the common raven from removal actions would still be greater than they were in the 1960s, 1970s, 1980s, and 1990s.

This alternative would immediately decrease hatchling and juvenile desert tortoise mortality from common ravens to provide a positive impact for the desert tortoise and would ultimately improve desert tortoise recruitment. Additionally, because common raven removal would not be limited to only those ravens known to prey upon desert tortoise, we would anticipate a positive cumulative impact for other wildlife species upon which the common raven preys with this reduced level of raven predation.

The cumulative impact of implementation of a cultural and physical based program, which includes a public education and outreach program by the USFWS and cooperating agencies, would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies can do to reduce human subsidies of food, water, nest sites, and roosts sites for the common raven. Over time, if these actions are implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be minimal. Less than a dozen jobs would be created from implementation of this action. Compared to the tens of thousands of people and jobs that are in the California desert, this impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be minimal. Implementation would not expose people to potential health hazards. Use of

firearms and avicide bait would be by trained professionals and within defined geographic areas that are generally away from human populations. It is consistent with existing health and safety regulations. It would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may restrict the public from fully using a small number of sites. This action would also provide a benefit by increase wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal and state agencies in their land management plans.

4.10.1.1.4 Alternative D

The removal of 3,000 to 7,000 ravens (8 to 18.7 percent) annually is potentially large enough to lead to a minimal negative cumulative impact on raven populations within the California desert region. The annual population growth rate for the common raven from 1966 to 1999 was 5.4 percent in the Mojave Desert and 7.1 percent in the Colorado Desert. We are unaware of any other raven removal or depredation activities currently planned or conducted in the California desert. There are raven depredation activities being conducted within the state and in adjacent states, primarily associated with loss of agriculture and livestock. Since the common raven in the California desert is a resident or nonmigratory animal, these depredation activities should not affect the common ravens in the California desert. Over the long-term, this level of removal would reduce the overall common raven population in the California desert. However, population levels of the common raven after the removal actions would still be greater than they were in the 1960s, 1970s, 1980s, and 1990s. We would not expect the additional raven removal actions proposed in this alternative to have a long-term significant impact on the survival or continuation of the species.

This alternative would decrease hatchling and juvenile desert tortoise mortality to provide a positive cumulative impact for desert tortoise and would ultimately improve desert tortoise recruitment. Additionally, because raven removal would not be limited to only ravens known to prey upon desert tortoise, we would anticipate a positive impact for other wildlife species that are prey for the common raven with this reduced level of predation.

The cumulative impact of a public education and outreach program by the USFWS and cooperating agencies would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies can do to reduce human subsidies of food, water, nest sites, and roost sites for the common raven. Over time, if these actions are fully implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be negligible. Less than a handful of jobs would be created from implementation of this action.

Compared to the tens of thousands of people and jobs that are in the California desert, this change in socioeconomic benefits impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be minimal. Implementation would not expose people to potential health hazards. Use of firearms and avicide bait would be by trained professionals and within defined geographic areas that are generally away from human populations. It is consistent with existing health and safety regulations. It would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may restrict the public from fully using a small number of sites. This action would also provide a benefit by increasing wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal and state agencies in their land management plans.

4.10.1.1.5 Alternative E

Under Alternative E, many of the current cultural and physical methods would be used but in an integrated program with a larger scope. The common raven populations would be expected to continue to increase for a few generations, because this is the expected time it would take for the public and agencies to fully implement these methods and produce results. Raven populations would be expected to continue preying on hatchling and juvenile desert tortoises at the current or increased rate. This would contribute to declining desert tortoise populations and cause a lag in desert tortoise recovery. Without substantially reducing hatchling and juvenile desert tortoise mortality and increasing desert tortoise recruitment, it would remain impossible for desert tortoise populations to recover. The need to accomplish this as soon as possible is especially important in the Western Mojave Recovery Unit. The long-term use of cultural and physical methods is anticipated to stabilize and eventually result in reduction of the raven populations, but not below historic levels.

We anticipate the cumulative impacts to socioeconomics, human health and safety, and recreation in the California desert to be none. The USFWS and other agencies would not be implementing actions that would create or remove jobs from the area and would not be implementing actions that would affect human health and safety or recreation.

4.10.1.1.6 Alternative F

The removal of 200 to 7,000 common ravens (0.5 to 18.7 percent) annually is potentially large enough to lead to a minimal negative cumulative impact on raven populations within the California desert region. The annual population growth rate for the common raven from 1966 to 1999 was 5.4 percent in the Mojave Desert and 7.1 percent in the Colorado Desert. We are unaware of any other raven removal or depredation activities currently planned or conducted in the California desert. There are common raven depredation activities being conducted within the state and in adjacent states, primarily associated with loss of agriculture and livestock. Since the

common raven in the California desert is a resident or nonmigratory animal, these depredation activities should not affect the common ravens in the California desert. Over the long-term, this level of removal would reduce the overall common raven population in the California desert. However, population levels of the common raven after the removal actions would still be greater than they were in the 1960s, 1970s, 1980s, and 1990s. We would not expect the additional raven removal actions proposed in this alternative to have a long-term significant impact on the survival or continuation of the species. In addition, this alternative provides the flexibility to remove the minimum number of common ravens needed to meet the proposed action.

This alternative would decrease hatchling and juvenile desert tortoise mortality to provide a positive cumulative impact for desert tortoise and would ultimately improve desert tortoise recruitment. Additionally, because raven removal would not be limited to only ravens known to prey upon desert tortoise, we would anticipate a positive impact for other wildlife species that are prey for the common raven with this reduced level of predation.

The cumulative impact of a public education and outreach program by the USFWS and cooperating agencies would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies can do to reduce human subsidies of food, water, nest sites, and roost sites for the common raven. Over time, if these actions are fully implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be negligible. Less than a handful of jobs would be created from implementation of this action. Compared to the tens of thousands of people and jobs that are in the California desert, this change in socioeconomic impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be minimal. Implementation would not expose people to potential health hazards. Use of firearms and avicide bait would be by trained professionals and within defined geographic areas that are generally away from human populations. It is consistent with existing health and safety regulations. It would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may restrict the public from fully using a small number of sites. This action would also provide a benefit by increasing wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal and state agencies in their land management plans.

4.10.2 U.S. Environmental Protection Agency (U.S. EPA) Guidance on Cumulative Impacts

The U.S. EPA has identified criteria they use to analyze all aspects of the natural environment when reviewing NEPA documentation. These criteria focus on ecological and evolutionary processes, such as natural disturbance regimes, hydrological processes, nutrient cycles, and biotic interactions. These processes summarize and capture the cumulative effects at the landscape scale. As a practical matter, the guidance suggests that environmental assessments should focus on ecological processes and how they can be affected by various stressors (U.S. EPA 1999).

The 10 ecological processes identified by the U.S. EPA that we evaluated to determine potential cumulative effects on the habitat and ecological resources are discussed as follows:

a. Habitats Critical to Ecological Processes–Loss of keystone habitats, such as desert springs, California native grasslands, Southern California coastal sage scrub, and California riparian forests and wetlands are not expected to be impacted because no construction or ground-disturbing activities are planned as part of this proposed action.

b. Patterns and Connectivity of Habitat Patches–Since no new construction, ground-disturbing activities, or changes in land use are planned, there would be no expected loss of rare habitats or connectivity among habitat patches, or change in homogeneity across the landscape.

c. Natural Disturbance Regimes–No natural disturbance regimes such as fire, flood, or insect infestations, or ground-disturbing activities would be expected to result from the proposed action. Increases to water sources, streams that would increase the vegetation in the desert climate, are not planned; as such additional fire sources or food sources for insects would not be expected.

d. Structural Complexity–Loss or reduction of components that create structural diversity, such as coarse woody debris, Joshua trees, and downed trees; reduced structural complexity in riparian areas; and reduced complexity of micro-site structures are not be anticipated because no new ground-disturbing activities are planned in these areas.

e. Hydrologic Patterns–Changes in water chemistry, including temperature changes, reduced infiltration, increased surface flow, or greater variation in flow frequencies and volumes, would not be expected. Construction activities that might alter the hydrologic patterns are not planned as part of the proposed action.

f. Nutrient Cycling–Because of the limited scope of the proposed action, contact with the habitat would be limited; a disruption of feedback loops that conserve and recycle nutrients, increase leaching of nutrients from the system, or alter levels and normal patterns of variation of nutrients would not be expected.

g. Purification Services–The method by which the ecosystem breaks down waste and detoxifies contaminants and the ability of the system to process waste materials, toxics, or other contaminants would not be affected. Any waste materials generated as part of the proposed action would be managed and disposed following specific federal and state guidelines.

h. Biotic Interactions–Some changes to nontarget species are expected. The current common raven population in the California desert is at a historically high level with an increasing trend for the last few decades. Increasing the survivorship of the desert tortoise is a goal of this proposed action, and the reduced predation pressure is expected to increase the survivorship of hatchling and juvenile desert tortoises. Other wildlife species that are prey for the common raven would also be expected to benefit with increased survivorship.

i. Population Dynamics–Mechanisms that tend to lessen fluctuations in populations, greatly increase populations (equals overpopulation), irruptions, and cause population crashes would not be affected because of the extremely limited contact by professionally training biologists as noted previously.

j. Genetic Diversity–Loss of genotypes, a reduction in generic variation, and genetically based deformities and reproduction dysfunction would not be expected because activities would be very limited, thus minimizing any potential for affecting genetic diversity.

We looked at these cumulative effects of the six alternatives to these ecological processes and determined that they do not apply.

4.10.3 USFWS Guidance on Analysis of Threats to Listed Species

For the cumulative impacts under the USFWS guidelines, we will focus discussion on the resource issues for target species (the common raven) and nontarget species (the desert tortoise and other wildlife). For these issues we have identified potential cumulative impacts to habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction. Tables 4-6a and 4-6b summarize the USFWS guidance on analysis of threats to listed species associated with common raven management projects.

4.10.3.1 Common Raven

4.10.3.1.1 Past Actions

Habitat Degradation/Habitat Loss

In this document, we are defining habitat degradation and habitat loss as the alteration and/or removal of native habitat in the California desert. For the common raven, past federal land management actions that have impacted the common raven through habitat degradation and loss include inadvertently providing increased food, water, and nest and roost sites in the California desert to support the needs of a growing human population in the desert or to support agency missions. While these land management actions have degraded or destroyed native habitat in the California desert, this habitat modification has impacted the common ravens by providing this species with these life requisites previously not present on a sustainable basis in the California desert.

Exotic Species

In the past, there was little knowledge of, recognition of, or concern for the impacts that might result from the introduction of exotic species to the California desert by land management agencies. Regulated management activities provided opportunities for unintentional importation of exotic plant and animal species from outside the California desert as regional and interstate commerce from activities such as grazing and mining promoted the transport of goods into and out of the desert. During the last few decades, federal land management agencies have become aware of this impact and have implemented actions in their management plans to reduce the likelihood of new species being introduced in the future. These unintentional introductions of

exotic plant and animal species to the California desert do not appear to have impacted the common raven.

Disease/Contaminants

We are unaware of any disease or contaminant issues associated with common raven management projects in the past. Past actions by the BLM to reduce predation by the common raven in the California desert are discussed in Section 3 of Appendix D. As part of this effort, the avicide DRC-1339 was used for 6 days in 1989 at the Desert Tortoise Natural Area in Kern County and the Marine Corps Air Ground Combat Center near Twenty Nine Palms. Because of

Table 4-6a. Summary of Fish and Wildlife Guidance on Analysis of Threats to Listed Species Associated with Common Raven Management Projects: Common Ravens (Target Species)

Fish and Wildlife Service Concerns	Past	Present	Alternatives Plus Reasonably Foreseeable Action					
			Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Habitat degradation	Increased food, water, and nest resource from human development	Increased food, water, and nest resource from human development	**Minor Beneficial**, Increased food, water, and nest resource from human development	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no proposed ground disturbing activities are	**No Effect**, no ground disturbing activities are proposed
Habitat loss	Increased food, water, and nest resource from human development	Increased food, water, and nest resource from human development	**Minor Beneficial**, Increased food, water, and nest resource from human development	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed
Exotic species	Management activities inadvertently introduced exotic species to California desert (e.g., grazing)	Relative number of new introduced species is low	**No Effect**, Relative number of new introduced species is low; no documentation of impacts to ravens from their occurrence	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven
Disease and/or Contaminants	No known disease or contamination issues	Potential for West Nile virus near standing water sources	**Negligible Adverse**, Potential for West Nile virus near standing water sources	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices
Mortality/Reduced Reproduction	No known authorized take in project area except BLM program in 1989	No known authorized take in project area	**No Effect**, no known authorized take in project area	**Minimal Adverse**, Take of approximately 0.5 percent of total population; habitat for food, water, nesting, and roosting would be reduced	**Minimal Adverse**, Take of approximately 5 percent of total population; habitat for food, water, nesting, and roosting would be reduced	**Minor Adverse**, Take of approximately 8 to 19 percent of total population; habitat for food, water, nesting, and roosting would be reduced	**Minimal Adverse**, Habitat for food, water, nesting, and roosting would be reduced	**Minor Adverse**, Take of approximately 8 to 19 percent of total population; habitat for food, water, nesting,

Table 4-6b. Summary of Fish and Wildlife Guidance on Analysis of Threats to Listed Species Associated with Common Raven Management Projects: Desert Tortoise and Other Nontarget Species

Fish and Wildlife Service Concerns	Past	Present	Alternatives Plus Reasonably Foreseeable Action					
			Alternative A (Status Quo)	**Alternative B**	**Alternative C**	**Alternative D**	**Alternative E**	**Alternative F**
Habitat degradation	Historic land management plans have authorized activities that have degraded habitat	Better management plans with limited ability to implement	**Minor Adverse**, Better management plans with limited ability to implement	**No Effect**, no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed
Habitat loss	Historically a small percentage lost because of implementation of land management plans	Existing management plans developed under stricter regulatory requirements	**Minor Adverse**, Existing management plans developed under greater regulatory requirements	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed
Exotic species	Management activities inadvertently introduced exotic species to California desert (e.g., grazing)	Relative number of new introduced species is low	**Minimal Adverse**, Relative number of new introduced species is low	**Minimal Adverse**, Potential inadvertent vehicle transport of nonnative species to the California desert	**Minimal Adverse**, Same as Alternative B but with greater number of vehicle trips	**Minimal Adverse**, Same as Alternative C but with greater number of vehicle trips	**Minimal Adverse**, Same as Alternative B but less vehicle trips Relative number	**Minimal Adverse**, Same as Alternative C but with greater number of vehicle trips
Disease and/or Contaminants	Pre-1990, no standard protocols in management plans to minimize disease transmission; effects of contaminants limited to widely scattered industrial sites	Disease transmission minimized through implementation of protocols; effects of contaminants limited to widely scattered industrial sites with improved industrial practices	**Negligible Adverse,** Disease transmission minimized through implementation of protocols; effects of contaminants limited to widely scattered industrial sites with improved industrial practices	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely

Table 4-6b. Summary of Fish and Wildlife Guidance on Analysis of Threats to Listed Species Associated with Common Raven Management Projects: Desert Tortoise and Other Nontarget Species (Concluded)

Fish and Wildlife Service Concerns	Past	Present	Alternatives Plus Reasonably Foreseeable Action					
			Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Mortality/Reduced Reproduction	Historically management plans allowed some activities that resulted in mortality of wildlife	Existing management plans developed under stricter regulatory requirements	**Minimal Adverse,** Existing management plans developed under stricter regulatory requirements	**Minimal to Minor Beneficial and Negligible Adverse**, reduced raven predation on desert tortoises and other wildlife species; nesting and roosting habitat for large birds reduced	**Minimal to Minor Beneficial and Negligible Adverse**, more ravens removed, therefore less predation that in Alternative B; roosting and nesting habitat for large birds reduced	**Minimal to Minor Beneficial and Negligible Adverse**, more ravens removed, therefore less predation than in Alternatives B and C; nesting and roosting habitat for large birds reduced	**Minimal Beneficial and Negligible Adverse**, reduced raven predation on desert tortoises and other wildlife species but at much slower rate than Alternatives B, C, and D; nesting and roosting habitat for large birds reduced	**Minimal to Minor Beneficial and Negligible Adverse**, range of number of ravens removed as needed (same as Alternatives B, C, and D); reduced raven predation on desert tortoises and other wildlife species; nesting and roosting habitat for large birds reduced

Notes:
1. No Change or None–There are no impacts expected.
2. Negligible–The impacts are very small and possible, but not probable or likely to occur.
3. Minimal–The impacts are not expected to be measurable and are within the capacity of the impacted system to absorb the change, or the impacts can be compensated for with little effort and resources so the impact is not substantial.
4. Minor–The impacts are measurable, but are within the capacity of the impacted system to absorb the change, or the impacts can be compensated with limited effort and resources so the impact is not substantial.
5. Moderate–Potentially adverse impacts that are measurable but do not violate any laws or regulations and are within the capacity of the impacted system to absorb or can be mitigated with effort and/or resources so that they are not significant.
6. Major–Potentially adverse impacts that individually or cumulatively could be significant.

the careful and selective use of this avicide, short time period of use, limited location, and short persistence of this avicide in the environment, we would consider this avicide to be a contaminant with an impact limited to the time period of its application.

Mortality/Reduced Reproduction

Within the California desert, we are not aware of any land management plan or permitted action that authorized the mortality of the common raven in the California desert other than those discussed in Section 3 of Appendix D. Such authorization would have been required under the Migratory Bird Treaty Act and, more recently, the National Environmental Policy Act. The 1989 BLM plan was implemented for 6 days and removed approximately 120 birds.

4.10.3.1.2 Present Actions

Habitat Degradation/Habitat Loss

Present federal land management actions that impact the common raven regarding habitat degradation and loss are similar to those of the past. Development of desert habitat to support the needs of a growing human population in the desert or accomplish agency missions continues to occur. These actions result in a greater increase in food, water, nest sites, and roost sites in the California desert for the common raven. While these human activities continue to degrade or destroy native habitat in the California desert, this habitat modification has impacted the common raven by providing it with life requisites previously not present on a sustainable basis in the California desert. Exotic Species

The current federal land management plans for the California desert include provisions for the implementation of these provisions continues to improve although there are still opportunities for unintentional importation of exotic plant and animal species from outside the California desert through visitors from outside the area and federal agencies conducting business activities. For example, we have the opportunity to introduce and spread exotic species in the California desert through transport of vehicles with seeds or plant parts imbedded in the tread of vehicle tires, trapped in the grills or other crevices of vehicles, or imbedded in mud or dirt on vehicles. These unintentional introductions of exotic plant and animal species to the California desert do not appear to have adversely impacted the common raven or its habitat requirements.

Disease/Contaminants

For disease, there is potential for WNV to adversely impact common ravens. West Nile virus was introduced in North America in 1999. As of 2005, WNV has been documented in desert communities in San Bernardino, Los Angeles, Kern, and Riverside counties. Since the potential exists for common ravens to contact mosquitoes that carry the virus when near standing water sources and the disease is potentially fatal to common ravens, the disease could impact the raven population in the desert by killing a proportion of the population. However, there has been little documentation that the disease has impacted the population through a reduction in population size.

We are not aware of any current contaminants issues in the California desert that would contribute to cumulative impacts to the common raven.

Mortality/Reduced Reproduction

Within the California desert, we are not aware of any land management plan or permitted action authorizing the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and APHIS-WS to determine if a permit has been issued to remove common ravens or if there are current or recent activities to remove common ravens in the California desert. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring at other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock.

4.10.3.2 Comparison of Alternatives under USFWS Guidelines

4.10.3.2.1 Alternative A, Status Quo (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the same as those described above in Present Actions (Common raven), for habitat degradation, habitat loss, exotic species, disease, contaminants, and mortality. We have analyzed these impacts and determined that Alternative A (status quo) results in minor beneficial impacts for habitat degradation and loss, no effect for exotic species, negligible adverse impacts for disease/contaminants, and no effect for mortality/reduced reproduction.

4.10.3.2.2 Alternative B (Common Raven)

We have identified and reviewed federal planning documents for the California desert (Appendix E) and are aware of the general management plans for the counties of Imperial, Inyo, Kern, Los Angeles, Riverside, and San Bernardino. We have identified large-scale land use action that would alter the current land use. The large-scale proposed actions include the expansion of the National Training Center at Ft. Irwin, the residential development of the Sunland area southwest of Barstow, and the agricultural/industrial development in the Harper Lake area (e.g., Harper Lake Dairy Park). Numerous small residential, commercial, industrial, and agricultural developments are proposed throughout the counties listed above and within the city limits of many desert municipalities. For the California desert, however, we were unable to identify any current or proposed plans that are similar to the proposed action in this EA.

Habitat Degradation/Habitat Loss

There would be no alteration or removal of native desert habitat; therefore, there would be no habitat degradation from implementation of raven management activities on federal lands. No new ground disturbance activities are proposed that would contribute to native habitat loss, therefore, there would be no impact from habitat loss.

Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. However, current federal land management plans for the California desert include

provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

Disease/Contaminants

For disease, the impact from this alternative when considered with other raven management projects would be negligible and adverse. There is potential for WNV to adversely impact common ravens. West Nile Virus was introduced in North America in 1999. As of 2005, WNV has been documented in desert communities in San Bernardino, Los Angeles, Kern, and Riverside counties. While the disease is potentially fatal to common ravens, there has been little documentation that the disease has had an adverse impact on the population. This potential would be less than for Alternative A because federal agencies would implement better water management practices to reduce or eliminate standing water from human sources.

The use of an avicide to remove common ravens could be considered a contaminant. However, its placement, monitoring, and limited toxicity over time should minimize its impacts to target individual ravens. We are not aware of any other contaminants issues in the California desert that would contribute to cumulative impacts to the common raven. This impact would be negligible and adverse.

Mortality/Reduced Reproduction

Within the California desert, we would propose to remove a maximum of approximately 0.5 percent of the adult population of common ravens/2.4 percent of the adult and nestling population. We are not aware of any other proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and USDA Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests. This should impact the common raven by reducing reproductive success.

4.10.3.2.3 Alternative C (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternative B (Common Raven), for habitat degradation, habitat loss, exotic species, and disease/contaminants. The impacts would be greater for mortality/reduced reproduction.

Mortality/Reduced Reproduction

Within the California desert, we would propose to remove a maximum of approximately 5.3 percent of the total population of common ravens. We are not aware of any other

proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests.

4.10.3.2.4 Alternative D (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternative C (Common raven)**,** for habitat degradation, habitat loss, exotic species and disease/contaminants. The impacts would be greater for mortality/reduced reproduction.

Mortality/Reduced Reproduction

Within the California desert, we would propose to remove a maximum of approximately 8 to 18.7 percent of the total population of common ravens. We are not aware of any other proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests. This should impact the common raven by reducing reproductive success.

4.10.3.2.5 Alternative E (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternative B (Common Raven), for habitat degradation, habitat loss, exotic species, and disease/contaminants. The impacts would initially be less for mortality/reduced reproduction but similar after several years.

4.10.3.2.5.1 Mortality/Reduced Reproduction

Within the California desert, there would be no authorized mortality from federal management actions. We are not aware of any other proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and USDA Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the

number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests. This should impact the common raven by reducing reproductive success.

4.10.3.2.6 Alternative F (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternatives B, C, and D (Common Raven)**,** for habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction.

4.10.3.3 Desert Tortoise and Other Nontarget Species

4.10.3.1.1 Past Actions

4.10.3.3.1.1 Habitat Degradation/Habitat Loss

Federal historic land management plans have authorized activities that have degraded desert habitat or did not address activities that degraded or destroyed habitat. Habitat management and conservation on federal lands became a regulatory requirement in the 1970s with the passage of several environmental laws. A smaller percentage of the existing habitat was lost because of implementation of land management plans. Lands were needed to implement agency missions and provide for the needs of a small but growing population in the area.

4.10.3.3.1.2 Exotic Species

In the past, there was little knowledge of, recognition of, or concern for the impacts that might result from the introduction of exotic species to the California desert by land management agencies. Regulated management activities provided opportunities for unintentional importation of exotic plant and animal species from outside the California desert as regional and interstate commerce from activities such as grazing and mining promoted the transport of goods into and out of the desert. During the last few decades, federal land management agencies have become aware of this impact and have implemented actions in their management plans to reduce the likelihood of new species being introduced in the future.

4.10.3.3.1.3 Disease/Contaminants

In the past, many wildlife diseases that are known to occur in species in the California desert were not known or had not been transmitted to species in the desert. Prior to the early 1990s, there were no standard protocols in management plans to minimize the transmission of known or unknown diseases from handling desert species. This practice recently changed with the identification of wildlife diseases (e.g., Upper Respiratory Tract Disease, Newcastle's disease, WNV) and development of protocols to minimize the probability of transmission.

The effects of contaminants on the desert tortoise and other wildlife species are limited to industrial sites scattered throughout the California desert. Some of these sites are past mining operations that used contaminants to process materials (e.g., cyanide or other hazardous chemicals) or were found in conjunction with or are byproducts of processing the ore (e.g., arsenic). These contaminants would impact the desert tortoise and other wildlife species in the form of injury, disease, or mortality. These contaminants and their impacts would have occurred on an infrequent basis and scattered throughout the desert.

4.10.3.3.1.4 Mortality/Reduced Reproduction

In the past, activities regulated under land management plans allowed activities that incidentally killed wildlife species. This mortality was not regulated or disclosed until passage of several environmental laws in the 1970s and the listing of the desert tortoise under the Endangered Species Act in 1989. The impacts to wildlife species from this mortality would have been a reduced population size at and near the locations of these activities.

4.10.3.3.2 Present Actions

4.10.3.3.2.1 Habitat Degradation/Habitat Loss

Current federal land management plans have included recent scientific knowledge plus stricter regulatory requirements to manage and monitor for the desert tortoise and other nontarget species. The full implementation of many of these plans has been hampered by reduced funding. The increased demand for land use to support the needs of a growing human population in and adjacent to the desert and accomplish agency missions continues to occur. Thus, habitat degradation and loss continues from both authorized and unauthorized activities with limited ability to monitor and enforce. A smaller percentage of the existing habitat is lost because of implementation of land management plans under stricter regulatory requirements. However, there is no overall coordination in the development of these management plans which results in a patchwork of development actions scattered throughout much of the desert. For the desert tortoise and other wildlife species, this impact from present action continues to result in degradation and loss of native desert habitat.

4.10.3.3.2.2 Exotic Species

The current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. The implementation of these provisions continue to improve although there are still opportunities for unintentional importation of exotic plant and animal species from outside the California desert from visitors from outside the area and federal agencies conducting business activities. Because of the continued opportunity to introduce exotic species to the California desert and the difficulty in managing established exotic species, the impacts to wildlife species including changes in forage species abundance and composition, availability of less nutritious species for food, reduction or loss of shade and cover provided by plants, increased frequency of fire, and type conversion of dominant woody species to other habitat types.

4.10.3.3.2.3 Disease/Contaminants

Currently disease transmission has been minimized or eliminated from the development and implementation of standard protocols. Federal agencies usually require the use of standard protocol in permits and other authorizing documents they issue. The present impact from disease transmission and spread has been greatly reduced or eliminated from implementation of these protocols.

The impacts of contaminants to the desert tortoise and other wildlife species are limited to industrial sites scattered throughout the California desert. Some of these sites are existing mining operations that use contaminants to process materials (e.g., cyanide or other hazardous chemicals) or are found in conjunction with or are byproducts of processing the ore (e.g., arsenic). These contaminants would impact the desert tortoise and other wildlife species in the form of injury, disease, or mortality. These contaminants and their impacts have occurred on an infrequent basis and scattered throughout the desert.

4.10.3.3.2.4 Mortality/Reduced Reproduction

Current land management plans have been developed and are being implemented under environmental legislation that places stricter requirements on minimizing or avoiding mortality to wildlife species. The impacts to wildlife species in the form of mortality should be less on a per project basis than in the past. However, the number of projects currently in place and in process is greater than that in the past. Impacts to the desert tortoise and other wildlife species continue to occur in the form of mortality.

4.10.3.4 Comparison of Alternatives under USFWS Guidelines

4.10.3.4.1 Alternative A (Status Quo)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the same as those described above in Present Actions (Desert Tortoise and Other Nontarget Species), for habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction. We have analyzed these impacts and determined that Alternative A (status quo) results in minor adverse impacts for habitat degradation and loss, minimal adverse impact for exotic species, negligible adverse impacts for disease/contaminants, and minimal adverse impacts to mortality/reduced reproduction.

4.10.3.4.2 Alternative B (Desert Tortoise and Other Nontarget Species)

4.10.3.4.2.1 Habitat Degradation/Habitat Loss

There would be no impact to habitat degradation from implementation of raven management activities on federal lands. No new ground disturbance activities are proposed that would contribute to habitat degradation. No desert habitat loss would occur from implementation of raven management activities. The impacts to habitat loss would be none for the desert tortoise and negligible adverse for other target species. The implementation of actions to reduce human-subsidized food, water, nest sites, and roost sites on federal lands in the California desert would be negligible and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.2.2 Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. However, current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

4.10.3.4.2.3 Disease/Contaminants

For disease, the impact from this alternative when considered with other raven management projects would be negligible and adverse. Disease transmission would be minimized or eliminated by implementing standard protocols. Federal agencies would require the use of standard protocol in permits and other authorizing documents they issue. The present impact from disease to desert tortoise and other nontarget species is negligible and adverse.

The use of the avicide to remove common ravens could be considered a contaminant. However, its placement, monitoring, and limited toxicity over time and to most other species would minimize its impact to nontarget species. This impact would be considered negligible and adverse.

4.10.3.4.2.4 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the reduction of ravens that prey on the desert tortoises. These ravens would also likely prey on other species of small wildlife so the rate of predation on these species would also be reduced. Reduced predation or reduced mortality would result in a minimal to minor beneficial impact for the desert tortoise and other nontarget species. However, the number of man-made sites available for use by large birds for nesting and roosting would be reduced. This would result in a negligible adverse impact for these species.

4.10.3.4.3 Alternative C (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described in Section 4.9.3.4.2, *Alternative B (Desert Tortoise and Other Nontarget Species)*, for habitat degradation, habitat loss, and disease/contaminants.

4.10.3.4.3.1 Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. This opportunity would be greater than for Alternative B because of the greater number of vehicle trips to the desert to remove a larger number of common ravens. However, current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

4.10.3.4.3.2 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the removal of more common ravens than in Alternative B. This action would occur in the Desert Tortoise Management Areas. These ravens would likely prey on the desert tortoise and other species of small wildlife. Removal of these ravens would mean reduced predation or reduced mortality in the DTMAs for all prey species for the common raven. Thus, the impact greater than for Alternative B as more common ravens would be removed; it would be minimal to minor and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.4 Alternative D (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described in Section 4.10.5.2.3, *Alternative C (Desert Tortoise and Other Nontarget Species)*, for habitat degradation, habitat loss, and disease/contaminants.

4.10.3.4.4.1 Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. This opportunity would be greater than for Alternative C because of the greater number of vehicle trip into the desert to remove a larger number of common ravens. However, current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

4.10.3.4.4.2 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the removal of ravens at Desert Tortoise Management Areas and raven concentration areas. These ravens would also likely prey on other species of small wildlife. Removal of these ravens would mean reduced predation or reduced mortality in the DTMAs and near concentration areas for desert tortoises and other nontarget wildlife species. Thus, the impact would be minimal to minor and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.5 Alternative E (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described above in Alternative B (Desert Tortoise and Other Nontarget Species), for habitat degradation and habitat loss.

4.10.3.4.5.1 Exotic Species

The current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic

species. The implementation of these provisions continue to improve although there are still opportunities for unintentional importation of exotic plant and animal species from outside the California desert from visitors from outside the area and federal agencies conducting business activities. We would continue to monitor desert tortoise mortality near common raven nests but there would be no vehicle trips to remove ravens. The number of vehicle trips would be less than for Alternative B. However, there is the continued opportunity to introduce exotic species to the California desert and difficulty in managing established exotic species. The impact would be minimal and adverse.

4.10.3.4.5.2 Disease/Contaminants

For disease, the impact from this alternative when considered with other raven management projects would be negligible and adverse. Disease transmission would be minimized or eliminated by implementing standard protocols. Federal agencies would require the use of standard protocol in permits and other authorizing documents they issue. The present impact from disease to desert tortoise and other nontarget species is negligible and adverse.

No avicide or other potential contaminant would be used therefore there would be no impact from contaminants on nontarget species.

4.10.3.4.5.3 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the gradual reduction of ravens in the California desert over time. Some of these ravens would likely prey on desert tortoises. All would likely prey on other species of small wildlife. A reduction in predation would mean a reduction in mortality but this reduction would be slower and smaller than in alternatives B, C, or D. Thus, the impact would be minimal and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.6 Alternative F- (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described above in Alternatives B, C, and D (Desert Tortoise and Other Nontarget Species), for habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction.

4.11 Related Environmental Documents

The following plans that contain similar or related actions concerning raven control and desert tortoise management were identified. Many of the activities recommended in the proposed action can be found in these documents. While all of these plans have addressed desert tortoise declines, the combined effect has not stopped the decline in desert tortoise populations and additional actions are considered necessary.

a. BLM Land Management Plans for the California Desert Conservation Area–The BLM uses the California Desert Conservation Area (CDCA) Plan and Amendments to guide management on the lands it administers. Any decisions made as a result of this EA process

would be consistent with the guidance in the CDCA Plan and Amendments and the Federal Land Policy and Management Act of 1976.

b. Death Valley National Park General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the NPS within Death Valley National Park.

c. Joshua Tree National Park General Management Plan–The subject plan was completed in 1994 and amended in 2000. The amended document, Record of Decision Final General Management Plan Amendment EIS/Backcountry and Wilderness Management Plan, guides the management of lands administered by the NPS within Joshua Tree National Park.

d. Mojave National Preserve General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the NPS within the Mojave National Preserve.

e. Programmatic Environmental Impact Statement–The APHIS-WS, formerly called Animal Damage Control (ADC), issued a Final EIS on the national APHIS-WS program (USDA 1997, revised). This EIS addressed an ongoing program of wildlife damage management. Information in the Final EIS that is pertinent to the alternatives in this EA has been incorporated by reference.

f. Master Memorandum of Understanding (MOU) between APHIS and BLM–This MOU specifies that all programs for animal damage management on lands administered by BLM would be coordinated with appropriate state and federal agencies prior to implementation. APHIS-WS would develop and update work plans for animal damage management annually in cooperation with the BLM and other appropriate agencies. APHIS-WS and BLM would identify restrictions for human safety or other mitigation that should be implemented to comply with the BLM's existing Land Management Plans.

g. Integrated Natural Resources Management Plans–Each of the six military installations within the California desert (Naval Air Weapons Station China Lake [NAWS], Edwards Air Force Base, National Training Center [NTC] at Fort Irwin, Marine Corps Logistics Base [MCLB] Barstow, Marine Corps Air Ground Combat Center Twentynine Palms [MCAGCC], and Chocolate Mountains Aerial Gunnery Range) is required to maintain and implement an Integrated Natural Resources Management Plan (INRMP).

The purpose of each INRMP is to develop and follow a prescribed planning process for the management of natural resources on the individual installation. Development and implementation of the INRMP must support military mission readiness by ensuring that lands and airspace are available for sustained use. This process meets statutory requirements under the Sikes Act Improvement Act (SAIA), Public Law 105-85, Div. B Title XXIX, Nov. 18, 1997, 111 Statutes 2017–2019, 2020–2033. This Act requires the Secretaries of the Army, Air Force, and Navy to prepare and implement INRMPs for each military installation, unless exempted due to the absence of significant natural resources.

Each installation coordinates with the USFWS and the CDFG to ensure that each INRMP reflects the mutual agreement of these parties on conserving, protecting, and managing natural resources on each installation. As required by the SAIA, the INRMPs are provided for public comment.

h. County General Plans–California state law requires each county to prepare and adopt a comprehensive and long-range general plan for its physical development (Government Code Section 65300). A comprehensive general plan provides the County with a consistent framework for land use decision-making. Traditionally, the general plan has been organized as a collection of "elements" or subject categories such as land use, housing, conservation, noise, circulation, open space, and safety. The conservation element addresses the conservation, development, and use of natural resources including water, forests, soils, rivers, and mineral deposits. The open-space element details plans and measures for preserving open space for natural resources, the managed production of resources, outdoor recreation, public health and safety, and the identification of intensive agriculture and irrigated pasturelands. For the California desert there are five counties each with a county general plan for these elements. These plans are: Imperial County General Plan, Inyo County General Plan, Kern County General Plan, Los Angeles County General Plan (Antelope Valley), Riverside County General Plan, and San Bernardino County General Plan.

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APPENDIX A
BIOLOGICAL INFORMATION ON THE DESERT TORTOISE *(GOPHERUS AGASSIZII)* AND COMMON RAVEN (*CORVUS CORAX*)

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1.0 DESERT TORTOISE

1.1 Morphology and Genetics

The adult desert tortoise (Figure A-1) is a medium-sized, herbivorous land turtle in the family Testudinidae. The shell is high-domed, light brown to very dark brown in color with brown to orange or yellow in the centers of the scutes, particularly in young animals. The skin is dry and scaly with thick, stumpy, elephantine hind legs. The gular horn is a projection located at the anterior end of the plastron (that portion of the shell on the underside of the desert tortoise) and is more pronounced in adult males than females. Desert tortoises exhibit secondary sexual characteristics only after reaching adult size. These characteristics include a concave plastron, chin glands, a longer gular horn, and a longer tail. Males are usually larger than females. Adult desert tortoises weigh 10+ pounds and maximum length is from 11 to 16 inches (maximum carapace length [MCL]) for females and males (Boarman 2002). The carapace is the top portion of the shell.

Figure A-1. Adult Desert Tortoise (*Gopherus agassizii*)

The desert tortoise exhibits significant morphological and genetic variation throughout its range. Based on genetic and morphological criteria, *G. agassizii* is divided into at least two well-differentiated entities, one south and east of the Colorado River or the Sonoran population, and one north and west of the Colorado River or the Mojave population. The U.S. Fish and Wildlife Service listed the Mojave population of the desert tortoise as threatened (*Federal Register* April 2, 1990). The USFWS also identified six population segments or recovery units in the *Recovery Plan for the Desert Tortoise Mojave Population* (USFWS 1994). Each recovery unit represents significant adaptive variation within the species based on ecology, behavior, morphology, and genetics (Figure A-2).

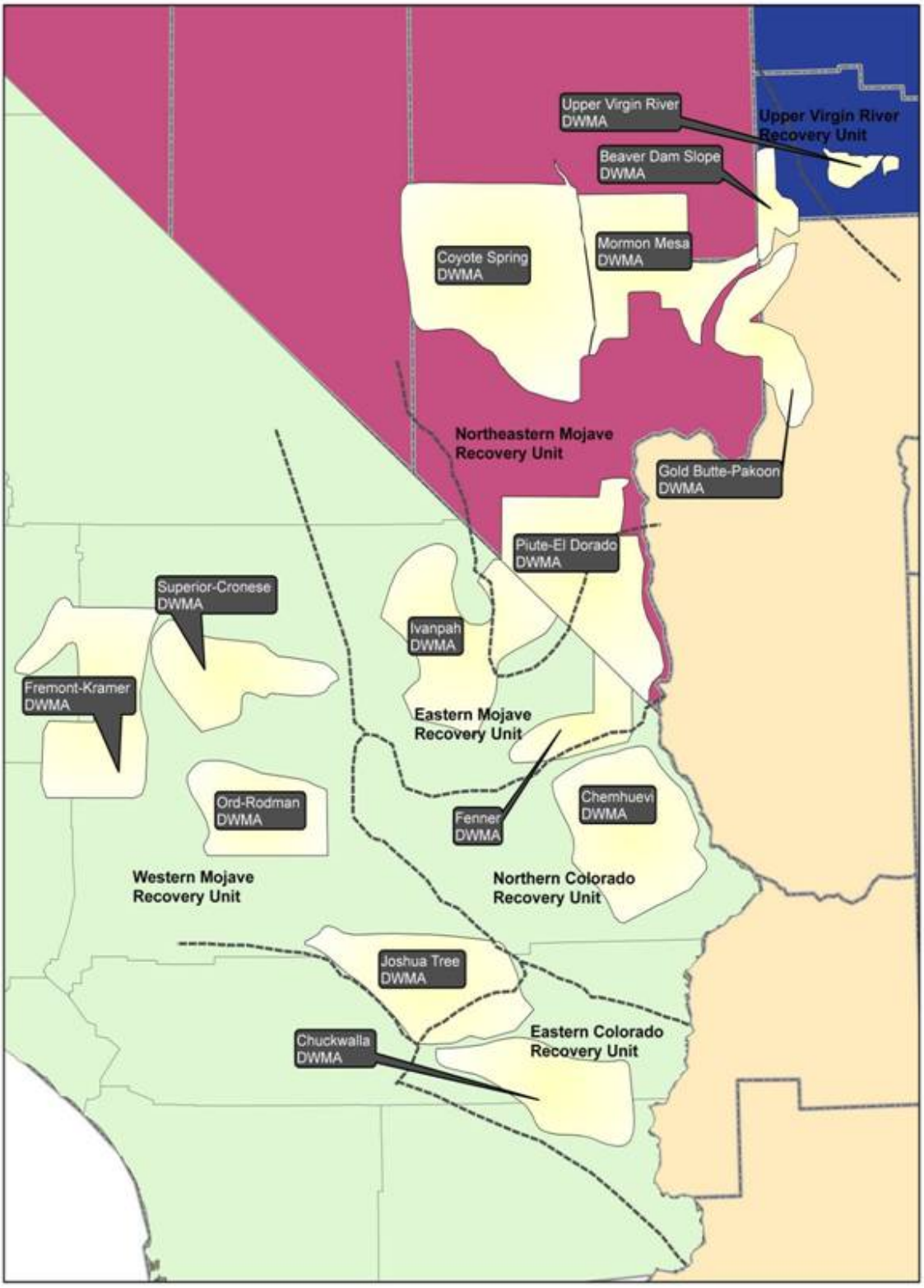

Figure A-2. Map of Recovery Units and Desert Wildlife Management Areas (DWMAs) in the *Recovery Plan for the Desert Tortoise Mojave Population*.

1.2 Range

Desert tortoises occur in suitable habitat in the Mojave and Sonoran deserts from southeastern California, southern Nevada, and extreme southwestern Utah, through western and southern Arizona, western Sonora and Sinaloa, Mexico. In California, desert tortoises occur in the desert from below sea level to an elevation of 7,300 feet, but the most favorable habitat occurs at elevations of approximately 1,000 to 4,000 feet (Luckenbach 1982, Schamberger and Turner 1986). No other land turtle occurs within the range of the desert tortoise.

1.3 Habitat

Habitat for the desert tortoise includes well-drained sandy loam soils of flats, valleys, alluvial fans, rolling hills, and occasionally rocky outcrops and mountain slopes in the California desert. They may also occur along the edges of basaltic flow, other rock outcrops, and lower elevation slopes of mountains. Desert tortoises typically avoid plateaus, playas, sand dunes, and steep slopes. They prefer areas with soils composed of sand and fine gravel versus coarse gravel, pebbles, and desert pavement (Weinstein 1989).

In California, the desert tortoise occurs primarily within the creosote, shadscale, and Joshua tree series of the Mojave desert scrub, and the lower Colorado River Valley subdivision of Sonoran desert scrub. Optimal habitat has been characterized as creosote bush scrub in which precipitation ranges from 2 to 8 inches, diversity of perennial plants is relatively high, and production of native annual plants is high (Luckenbach 1982, Turner and Brown 1982, Schamberger and Turner 1986). In one study in the western Mojave Desert, the greatest population densities of desert tortoises were in creosote bush scrub with lower densities occurring in Joshua tree woodland and Mojave-saltbush-allscale scrub. In the eastern Mojave Desert, desert tortoises showed a preference for woody bottle washer (*Camissonia boothii)*, popcorn flower (*Cryptantha angustifolia)*, desert dandelion (*Malacothrix glabrata)*, beavertail (*Opuntia basilaris)*, desert chicory (*Rafinesquia neomexicana)* and other species (Avery 1998). The native perennial bunchgrass, big galleta (*Hilaria [Pleuraphis] rigida*), is often present where the desert tortoise is most abundant.

Plant density and diversity play important roles in stabilizing soil, providing cover for protection from predators and temperature extremes, and providing adequate nutritional forage and water.

1.4 Reproduction

Desert tortoises are long-lived with delayed sexual maturity. Some individuals begin reproducing at 7.4 inches (180 mm) MCL, which they attain when about 12 to 15 years old. The majority of desert tortoises do not begin reproducing until they reach 8.2 inches MCL (208 mm), at approximately 12 to 20 years old (Turner and Berry 1984, Turner et al. 1986). Maximum longevity in the wild is likely to be about 50 to 70 years, the norm being 25 to 35 years (Germano 1992 and 1994). The average clutch size is 4.5 eggs (range 1 to 8), with 0 to 3 clutches laid per year (Turner et al. 1986). Clutch size and number probably depend on female size, water availability, and annual productivity of high quality forage plants in the current and previous year (Turner et al. 1984 and 1986, Henen 1997).

The life history strategy of the desert tortoise is longevity and ability to reproduce several times during its life. Under natural conditions, this strategy allows the species to persist despite the stresses of an extremely harsh and variable environment in the desert. The interaction of longevity, slow growth and late maturation, and relatively low annual reproductive output means that under the best circumstances desert tortoise populations recover slowly from natural- or human-caused losses in population density (USFWS 1994).

The desert tortoise mating system is probably polygynous (one male mating with many females), and it is polyandrous (one female mating with more than one male) (Murphy 2005). Choice of mate is mediated by aggressive male-male interactions and possibly by female choice (Niblick et al. 1994). Mating usually occurs in April and May when desert tortoises are active, and again in August through October if the right environmental conditions (i.e., temperature and food supply) are present. Most eggs are laid in spring (April through June) and occasionally in fall (September and October). Eggs are laid in sandy or friable soil, often at the mouth of the female's burrow or under a bush. Egg size is 37 to 47 mm by 36 to 46 mm (Berry 1975). The female excavates the nest (a hole in the ground), deposits the eggs, covers them, and urinates on the nest. There is no parental care. Most clutches contain 3 to 7 eggs. Hatching occurs 90 to120 days later, mostly in late summer and fall (mid-August to October). Sex determination of desert tortoises is environmentally controlled; hatchlings develop into females when the incubation temperature is greater than 89.3 degrees Fahrenheit (° F) (31.8 degrees Celsius [° C]) and males when the temperature is below that (Spotila et al. 1994). Mortality increases when incubation temperatures are greater than 95.5° F (35.3° C) or less than 78.8° F (26.0° C). The sensitivity of embryonic desert tortoises to incubation temperature may make populations vulnerable to changes in soil temperature (e.g., changes in vegetation cover or rising temperatures) (Boarman 2002).

Egg size is approximately 1.3 by 1.6 inches (35 mm by 45 mm) (Burge 1977) while hatchling size is slightly larger. Upon hatching underground in the summer or fall, the desert tortoise unfolds and absorbs its external yolk sac through the plastron. The newly hatched desert tortoise digs to the surface to escape the nest. The yolk sac is an initial reserve of nutrients upon which the desert tortoise depends until it is able to find forage; sometimes as long as the following spring. Hatchling desert tortoises resemble tiny versions of adults except they are usually lighter in color and do not have a bony or ossified shell to protect them from predators. They require shelter (e.g., burrows) to survive the desert extremes of temperature and humidity and for protection from predators. Eighty-three percent of hatchling desert tortoises excavated new burrows or enlarged preexisting rodent burrows in their first weeks (Niblick et al. 1994, Turner et al. 1984 and 1986, USFWS 1994).

1.5 Activity Period

Desert tortoises spend most of their time belowground in burrows they excavate, or they modify burrows of other animals. They emerge from their burrows during the day to look for food, regulate their body temperature, and to mate. Desert tortoises, including hatchling and juvenile desert tortoises, are most active in California during the spring and early summer when native annual plants, their food supply, are most common. Although they spend most of their lives underground to escape the extreme temperature and humidity conditions of the desert and for protection from predators, they become active in suitable weather at any time of the year; rainfall, particularly during the summer and early fall, often initiates activity. Desert tortoise

activity patterns are primarily controlled by ambient temperature and precipitation (Nagy and Medica 1986, Zimmerman et al. 1994). Adult desert tortoises were aboveground with body temperatures ranging from 77 to 95° F 25 to 35° C. Desert tortoises may also be active during periods of mild or rainy weather in summer and winter. During the spring season in the Mojave Desert, desert tortoises were observed aboveground for 3 hours every fourth day and some tortoises did not feed for several weeks following spring emergence from cover sites (Behler and King 1979). During inactive periods, desert tortoises retreat to their burrows, and spend approximately 98 percent of the time in these cover sites (Marlow 1979, Nagy and Medica 1986). During active periods, they usually spend nights and the hotter or cooler part of the day in their burrows; they may also rest under shrubs or in shallow burrows.

Hatchling desert tortoises emerge from their winter burrows as early as late January to take advantage of freshly germinating annual plants. As plants grow taller during the spring, some species become inaccessible to small desert tortoises. Their greatest period of activity is late winter to spring. Hatchling desert tortoises have been observed aboveground in January with air temperatures below 55° F (13° C). Hatchling and juvenile desert tortoises are more likely to be active in less optimal weather than adults (Wilson et al. 1999).

1.6 Cover Sites

Desert tortoises depend on their burrows to escape the extreme effects of temperature, humidity, and to avoid predators (Brattstrom 1965, McGinnis and Voigt 1971). The desert tortoise usually excavates and uses several burrows per season. Juvenile desert tortoises are particularly prone to excavate multiple burrows (mostly under large shrubs), and use abandoned rodent burrows (Woodbury and Hardy 1948, Luckenbach 1982). Soils must be friable enough for digging of burrows, but firm enough so that burrows do not collapse. In California, desert tortoises are typically associated with gravelly flats or sandy soils with some clay, but are occasionally found in windblown sand or in rocky terrain (Luckenbach 1982). In the Mojave Desert, where a veneer of desert pavement may obscure the sandy loam soils, burrows are most often located in the banks of washes and arroyos under these conditions.

Burrows often extend from 1 to 8 feet in length and have a single opening. Desert tortoises use an average of 7 to 12 burrows at any given time (Barrett 1990, Bulova 1994, Burge 1977); some burrows may be used for relatively short periods and then are replaced by other burrows. Burrows may also collapse with a desert tortoise inside. In this situation, the desert tortoise then must excavate its way out of the collapsed burrow. Desert tortoises sometimes share a burrow with several other desert tortoises (Bulova 1994) or other species such as snakes, scorpions, and kit foxes. For the Mojave Desert, burrows tend to open under a creosote bush (59 to 77 percent of the time) or white bursage shrub (21 percent). Deeper burrows, more properly called dens, are extensive and up to 30 feet in length. These dens are used frequently in winter and are often subject to communal use by several individuals (Woodbury and Hardy 1948, Boarman 2002). These “caliche dens” are located in the sides of washes and below the caliche or calcium carbonate layer in the soil.

1.7 Home Range

Desert tortoise activities are concentrated in core areas, known as home ranges. Since they do not actively defend this entire area, it is considered a home range, not a territory. Annual home range sizes have been measured at 10 to 450 acres (4 to 180 ha) and vary with sex, age, season, and density or availability of resources. There is significant overlap of home ranges of different individuals (USFWS 1994). In years of higher than average precipitation, desert tortoises have larger home ranges than during dry years. During their life span, the size of a desert tortoise's lifetime home range is considerably larger than that of its annual home range. This expansion of home range may be influenced by availability and distribution of food or mates. Adult female desert tortoises also move great distances (e.g., several miles) within a short time and may return within a few months or a few years.

1.8 Food and Nutrition

In general, desert tortoises forage primarily on native winter and summer annual plants, perennial grasses, cacti, and perennial shrubs in descending order of preference. Although they will eat nonnative plants, desert tortoises generally prefer native forbs when available (Jennings 1993, Esque 1993, Avery 1998). The dietary preference may place them at a nitrogen- and water-deficit physiological state that may be exacerbated by drought (Oftadal, Hillard, and Morafka 2002). Optimal diet items include forbs, which are higher in protein, carbohydrates, lipids, calcium, crude fiber, and water and are low in potassium. Forbs known in desert tortoise diets include *Eriogonum inflatum, Astragalus nuttallianus, Plantago insularis, Erodium cicutarium, Krameria parvifolia, Amsinckia* spp., *Camissonia* spp., *Descurainea* spp., *Lotus* spp., *Lupinus* spp., *Malacothrix* spp., *Gilia* spp., *Mentzelia nitens*, and *Nama* spp. Annual grasses in desert tortoise diets are largely nonnatives and include *Bromus rubens, Schismus barbatus, Festuca octoflora*, and the native *Bouteloua barbata*. Perennial grasses provide not only food, but also provide shelter, soil retention, and a longer growing season; these species include *Hilaria (Pleuraphis) rigida, Muhlenbergia porteri*, and *Oryzopsis hymenoides*. *Sphaeralcea ambigua*, a shrub, is regularly ingested by the desert tortoise, and *Opuntia basilaris* buds, flowers, and fruits are also seasonally ingested (Berry 1978). Desert tortoises will eat many species of plants. However, at any time, most of their diet often consists of a few species (Nagy and Medica 1986, Jennings 1993). Additionally, their preferences can change during the course of a season (Avery 1998) and over several seasons (Esque 1993). Possible reasons for desert tortoises to alter their preferences may include changes in nutrient concentrations in plant species, the availability of plants, and the nutrient requirements of individual animals (Avery 1998, Oftedahl et al. 2002).

Desert tortoises may sometimes ingest high-calcium materials such as limestone pebbles, caliche from layers along embankments, soil, and bones. The ingestion of calcium is most frequently observed in adult females and possibly in growing juveniles (Esque and Peters 1994, Marlow and Tollestrup 1982).

1.9 Mortality

Sources of mortality include predation, disease, and malnutrition. Kit foxes (*Vulpes macrotus*) are predators of desert tortoise eggs (Coombs 1977). Coyotes (*Canis latrans*), kit foxes, common ravens, ground squirrels (*Spermopholus* sp.) and native fire ants are known

predators of hatchling and juvenile desert tortoises (Ken Nagy, personal communication). Subadult and adult desert tortoises are prey for coyotes, kit foxes, bobcats (*Lynx rufus*), and mountain lions (*Felis concolor*), and domestic dogs (*Canis familiaris*).

Another source of mortality for the desert tortoise is disease. Disease is frequently the result of a suppressed immune system from other stresses in the environment, such as malnutrition. One disease is upper respiratory tract disease (URTD) which can be caused by mycoplasmosis or bacteria from the genus *Mycoplasma*, herpes virus, or other pathogens (Berry et al. 2006). Desert tortoises also suffer from shell disease or cutaneous dyskeratosis.

Human-caused or influenced sources of mortality include elevated levels of predation from common ravens and domestic dogs, shooting and vandalism, collecting, vehicle strikes on roads, and vehicle strikes of desert tortoises above and belowground by off-road vehicles. At certain locations, desert tortoises contain high levels of heavy metals such as mercury or arsenic, the source of which is believed to be nearby mining activities. These high levels of hazardous materials cause or contribute to poor health and mortality for the desert tortoise. Habitat degradation from soil surface disturbance (e.g., urban and agricultural development, mining, livestock grazing, or proliferation of roads) and the introduction of nonnative plant species with poor nutritional quality also cause or contribute to mortality.

A new cause of mortality to the desert tortoise is fire. A fire can kill a desert tortoise by burning the animal or from smoke inhalation. Fire will also destroy the habitat of the desert tortoise and cause the vegetation composition to change from native perennial shrubs and annual plants to nonnative annual plants. This is sometimes referred to as vegetation type conversion. Desert plant communities are not adapted to fire. With unsuitable vegetation present for cover and for forage, desert tortoises in the area die.

1.10 Desert Tortoise Population Trends

Population trend information is available from data collected at site locations and from data compiled across the range of the desert tortoise.

In 1994, the Recovery Plan presented data that showed populations of the desert tortoise in the western extent of the species' range were experiencing significant declines (USFWS 1994, Tracy et al. 2004). With the data available in the early 1990s, no trend in adult densities of desert tortoises was discernable. The population trend of the desert tortoise in the western Mojave Desert continues to decline and a downward trend has been documented for populations in the eastern Mojave Desert (Tracy et al. 2004).

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2.0 COMMON RAVEN

2.1 Morphology and genetics

Common ravens (*Corvus corax*) are the largest of all passerines or song birds (Figure A-3). They are in the same family as crows, jays, and magpies (Corvidae). The common raven is a large black conspicuous bird. It resembles the American crow in appearance, but is easily differentiated by larger body size, larger chisel-like bill, well-developed throat hackles, and a wedge-shaped tail. Sexes are similar in appearance. Life expectancy is 10 to 14 years.

Figure A-3. Adult Common Raven (*Corvus corax*).

There are four recognized subspecies in North America. The northernmost subspecies, *C. c. kamtschaticus* is a resident from northeast Siberia east to the Aleutian Islands and the Alaska Peninsula. *C. c. principalis* is a resident from north Alaska across Canada to Greenland and south to Oregon, northern Wisconsin, and the Appalachian Mountains of northern Georgia. *C. c. sinuatus* is a resident from southeast British Columbia and Montana south through the Great Plains and Great Basin and mainland Mexico to Nicaragua. *C. c. clarionensis* is a resident from northern California south through Baja California, east to southern Nevada and western Arizona. Common ravens occur throughout California, except for some areas of the Central Valley, parts of the central coast, and cultivated valleys of the south east (Small 1994). Common ravens in California are not known to migrate. Recent mitochondrial and microsatellite evidence indicates that common ravens in the

southwest United States are genetically distinct from ravens in the rest of their range (Omland et al. 1999).

2.2 Range

Common ravens are found throughout major portions of North America, Europe, Asia, and North Africa (Boarman and Heinrich 1999). Common ravens are widespread throughout North America and can be found in Canada, Alaska, and the contiguous United States (west of the continental divide, and throughout the Appalachian Mountains of the eastern United States (Figure A-4).

2.3 Habitat

Common ravens are found in a wide range of natural habitat types, preferring areas with some vertical relief (e.g. cliffs, trees, or human-made structures) to provide nesting and foraging sites (Boarman and Heinrich 1999). They occur in a broad range of habitats including ice flows and high mountains, deciduous and coniferous forests, tundras, prairies, grasslands and deserts, isolated settlements and cities, and agricultural fields.

The common raven is highly adaptable to a wide range of habitats and foods. Consequently, they often respond positively to human-influenced environments. They thrive in many human-altered habitats (Kristan et al. 2004, Webb et al. 2004), including agricultural areas (Engel and Young 1989a), roadsides and linear rights-of-way (Knight and Kawashima 1993, Sherman 1993), ranches (Rothe et al. 1999), rangelands (Knight 1984), and near campgrounds and picnic areas (Wallen et al. 1998, 1999). They have recently expanded their range in California and are increasing in density in areas already occupied (Boarman and Berry 1995, Boarman 2003, Leibezeit and George 2002).

2.4 Reproduction

Adult common ravens form long-term pair bonds. Little is known about pair formation and nest-site selection for common ravens. Pairs are thought to be monogamous throughout the year, although extra-pair copulations have been observed. Common ravens do not breed until 2 to 4 years of age (Jolie 1976). Nesting substrates are highly variable, ranging from cliffs to trees to powerlines, telephone poles, buildings, and highway overpasses (Boarman and Heinrich 1999). In the California desert, common ravens have been observed nesting in tamarisk trees (*Tamarix* sp.), Joshua trees (*Yucca brevifloria*), on transmission towers, distribution poles, rock outcrops (BLM 1990b) freeway signs (Rebecca Jones, CDFG, personal communication), and abandoned vehicles (Tom Egan, AMEC Earth and Environmental, personal communication). Many common ravens return to the same nest year to year, or build multiple nests (two to four) in close proximity and rotate between them year to year.

Nest construction begins in early to late winter; sticks are the predominant nest building material. Nest construction takes from 1 to 4 weeks. Egg-laying usually occurs in March to April, with clutch size ranging from three to seven eggs. Incubation lasts 20 to 25 days. The nestling stage lasts 5 to 7 weeks, with an average of three chicks produced per nest each year. Fledglings will stay near the nest for 4 to 8 weeks following their first flight, with most nests fledged by mid-June. Females perform most of the nest construction and incubation, while both parents feed the young. If a clutch is lost early in the season, a second clutch may be laid. However, there are few reports of a pair of ravens successfully raising two sets of chicks in a single season (Boarman and Heinrich 1999).

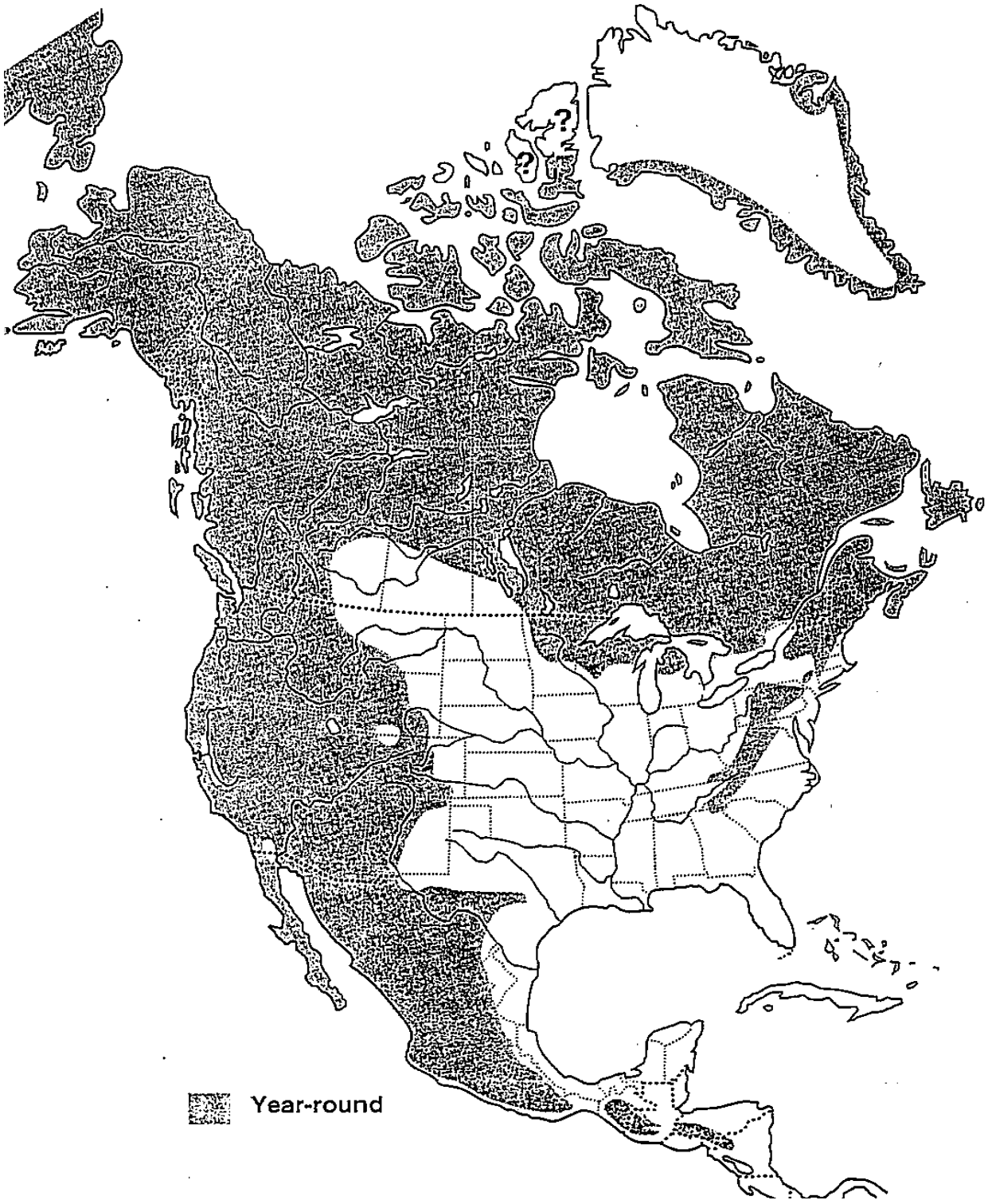

Figure A-4. Range of the Common Raven.

2.5 Activity Period

Common ravens are resident birds and active throughout the year in the California desert during the day.

2.6 Shelter

Nonbreeding ravens typically roost together at night, especially when a concentrated food source is nearby. Ravens generally roost in trees, on telephone poles, on powerlines, or communication towers. Roost size varies from a few birds to several thousand and generally peak in fall and winter (Chamblin and Boarman 2005). Roosts may serve as information centers for food by enabling new birds in a roost to find a previously located food source quickly (Heinrich 1988). Breeding adults usually do not join communal roosts and often roost at the nest site, even when not breeding (Engel et al. 1992).

2.7 Home Range and Territory

Common raven pairs typically occupy a home range in which they forage and nest. They establish territories, smaller areas within their home ranges in which the nest is built, that are nonoverlapping and defended year-round (most vigorously during the breeding season) (Boarman and Heinrich 1999). Unlike territories, home ranges of common ravens may overlap with those of neighboring raven pairs. Nonresident juvenile ravens often wander greater distances than territorial birds, and both resident and nonresident birds gather at sites of abundant food (e.g., landfills) (Heinrich et al.1994). Groups of ravens typically do not form a tight cohesive flock, but mix (Heinrich et al. 1994).

2.8 Feeding Behavior and Nutrition

Common ravens are general omnivores. The variety of food types in their diet often reflect differences within and among individuals, as well as the distribution of food in a given area (Engel and Young 1989a, Stiehl and Trautwein 1991, Kristan et al. 2004). Ravens commonly eat live meat, garbage, carrion, grains, eggs, and fruit. They are accomplished predators and use a variety of methods to attack and acquire food as a single predator or a pair. Prey species include arthropods, amphibians, reptiles, birds (adults, chicks, and eggs, e.g., mourning doves), and small mammals (Stiehl 1978, Sherman 1993, Boarman and Heinrich 1999). The following accounts demonstrate their efficiency as a predator. Ravens preyed on 3 of 15 breeding aggregations of western toads and ate more that 20 percent of the breeding toads at one aggregation (Olson 1989). More than one third of 282 pinyon jay nests were preyed upon by ravens or crows (Marzluff 1988). Ravens preyed on 95 of 647 nests of greater sandhill cranes in Oregon (Littlefield 1986). Common ravens prey on the eggs and young of several endangered species, including the western snowy plover, California least tern, California condor, marbled murrelet, and desert tortoise. While common ravens have been documented hunting and eating desert tortoises, not all ravens prey on desert tortoises.

Breeding common ravens concentrate their foraging activities during the breeding season within their territories (Sherman 1993). In the Mojave Desert, common ravens spend an equal amount of time scavenging and live hunting. Most (75 percent) hunting/food-finding activity takes place within 1,300 feet (400 meters) of the nest (Sherman 1993). Common ravens forage

within 1 mile (1.6 km) of linear rights-of-way (roads, railways, transmission powerlines, and telephone lines) and spend 49 percent of the time foraging directly on the linear rights-of-way (Sherman 1993). When human-subsidized food is present, ravens often concentrate their feeding at these food sources and travel distances may be significantly shorter (Engel and Young 1992b).

Common ravens typically concentrate their feeding activity in the morning and late afternoon (Engel and Young 1992a, Sherman 1993), which coincides with the most active desert tortoise times. Nonbreeders, usually juvenile vagrants, often form "crowds" when feeding at concentrated food sources (Heinrich 1988). These crowds lack cohesiveness in membership that most flocking birds exhibit (Heinrich et al. 1994); most members of the crowd are not closely related (Parker et al. 1994). Common ravens often cache food for later use (Heinrich 1988) and are thought to rely mostly on visual cues to detect prey (Littlefield 1995).

2.9 Mortality

Causes of mortality include predation and disease. Predation on raven eggs has never been recorded. Possible predators on nestlings include hawks, owls, and other common ravens (Boarman and Heinrich 1999). Predation on adult common ravens is rarely observed. Possible predators on fledglings before they become proficient at flying include the coyote (Webb et al. 2004).

Disease causes mortality among common ravens. In California, common ravens are susceptible to Newcastle's disease which can be fatal. Newcastle's disease is usually spread by illegal transport of domestic poultry and is fatal to poultry. Hence, when an outbreak of Newcastle's disease is identified, the California department of Food and Agriculture implement stringent immediate measures to contain the disease and remove the infected birds. West Nile virus is another disease that can be lethal to common ravens. West Nile virus is carried by mosquitoes, which infect animals upon which they feed including the common raven. In the California desert there have been few reports of WNV among birds. Most of the available information is on the infection rate of WNV to humans. In August 2006, the number of confirmed cases declined from previous years. This decline has been attributed to increasing immunity in humans and animals. For example, in San Bernardino County, the number of reported cases of WNV was 197 in 2004 and 35 in 2005 (Doan 2006).

2.10 Common Raven Population Trends

Population trend information was derived from museum accounts and the Breeding Bird Surveys (BBS) during the period of 1966 and 2004 (Boarman and Berry 1995, Liebezeit and George 2002, Boarman and Kristan 2006) and the Christmas Bird Count (CBC) database during the period of 1959 to 1999 (Liebezeit and George 2002). Both BBS and CBC data provide a large-scale or regional perspective on bird population trends across North America. Because all surveys are conducted from roadsides, there is a possibility of overestimating corvid numbers. Corvids, in particular common ravens, are often found at higher densities along roadsides than other less disturbed habitats (Knight and Kawashima 1993). However, these data provide a reliable index of corvid population trends in California because most other biases associated with BBS and CBC survey techniques are minimal regarding corvids, and roadside habitat is prevalent across the state. In the Mojave Desert, more than 36,000 miles (57,600 km) of roads cross the landscape (Sherman 1993).

Common ravens were uncommon in the California desert in the first half of the 20th century. In the early 1940s, Eugene Cardiff, Curator of Natural History at the San Bernardino County Museum, searched for 2 years in the western Mojave Desert to locate a specimen for the Museum (BLM 1990a). In the eastern Mojave Desert, Johnson et al. (1948) conducted a survey in the Providence, New York, and Clark mountains and adjacent areas and reported few ravens. They noted that the raven was only present in the summer.

Since that time, common raven populations appear to have increased in the past 50 years in most parts of the west. Prior to this, common ravens were reported as becoming scarcer in settled parts of California because of human persecution (Grinnell and Miller 1944). As early as the 1950s, common ravens showed signs of increasing numbers in some areas of western North America (Houston 1977). Analysis of BBS data from 1969 to 1979 indicate an increase in common raven populations throughout the west, with major increases noted in California (Robbins et al. 1986). Using BBS data from 1966 to 1990, Marzluff et al. (1994) also documented an increase in the common raven populations. The number of common ravens estimated to occur within the 12 western states is greater than one half million. In the Mojave and Colorado deserts of California, the number of common ravens is estimated at 37,500 ± 8,500 (M. Green personal communication.). This population estimate was calculated from BBS data using methods described in Rich et al. 2004. The 30-year population trend for the common raven in California indicates the species is increasing at a rate of 5.4 and 7.1 percent per year in the Mojave and Sonoran Deserts (Sauer et al. 1999, as cited by Liebezeit and George 2002).

From the 1920s to the 1970s, common ravens changed from a summer resident to a permanent resident (BLM 1990a). Between 1966 and 2004, common raven populations increased in the southwestern deserts of California. The BBS data from 1968 to 2004 indicated increases in the raven populations of more than 700 percent in the west Mojave Desert and more than 70 percent in the East Mojave Desert. There were similar increases in the Colorado Desert (Boarman and Kristan 2006). In adjacent areas of the Great Basin Desert of California and Nevada and the southern California basin, raven populations have increased 168 percent and 328 percent, respectively, in 25 years (Boarman and Berry 1995).

The underlying cause of corvid increase throughout California is inextricably linked to the activities of humans. Common ravens are "human commensals" and thrive in highly disturbed habitats including agriculture, suburban, and urban areas (Marzluff et al. 1994). Common ravens are generalist foragers, and readily eat human-produced wastes. A key factor in the common raven population increases is thought to be the availability of human food sources that subsidize raven populations (Boarman 1993, Marzluff et al. 2001). Their reproductive success in the Mojave Desert is enhanced significantly by proximity to human developments (Kristan et al. 2004, Webb et al. 2004). Additionally, water subsidies are thought to be an important factor contributing to raven increase in desert areas of California (Liebezeit and George 2004). Subsidized water sources include cattle watering troughs, irrigation canals, reservoirs, sewage treatment areas, and irrigated agricultural areas. Some have questioned whether artificial wildlife watering sources (e.g., guzzlers) have assisted in providing water for common ravens. Habitat fragmentation has also contributed to an increase in habitat generalists, like common ravens (Andren 1992). Ravens thrive in fragmented landscapes and habitats. Suitable nesting and roosting structures have also allowed common raven populations to expand into areas where natural nesting substrate is limited or absent. The social nature of common ravens improves their ability to exploit human food and water resources and

communal roost sites through their flocking behavior. Additionally, human persecution of common ravens has been reduced because of implementation of and education about the *Migratory Bird Treaty Act* in 1918 (Liebezeit and George 2004), which prohibits indiscriminate killing of migratory birds including the common raven.

2.11 Impacts of the Common Raven to the Desert Tortoise

Evidence of common ravens preying on hatchling and juvenile desert tortoises has been recorded numerous times during the past 25 years. Most of this information consists of observations reported by several researchers and field biologists; no standardized survey has been conducted. To develop a standardized method to collect data, a survey was initiated in 2004 and repeated in 2005 (McIntyre 2006, Boarman 2006). The objectives of this study were to ascertain the location of predatory bird nests in the Mojave Desert, determine the number and location of nests that were common raven nests, and locate evidence of hatchling and juvenile desert tortoise predation at nest sites. Using locations of historical raven nests (documented during the preceding 25 years), field workers located and recorded previously known nest locations and recorded the presence of nests at these sites or newly discovered nests along the route (Figures A-5 and A-6). Many of these nests were along transmission line routes. Under each nest area, the ground was searched for evidence of desert tortoise shells.

In summer 2004, 28 of 447 nests in the desert portions of San Bernardino, Kern, and Los Angeles counties were observed with evidence of desert tortoise predation beneath them. In 2005, 27 of approximately 600 nests in the desert portions of Kern, Los Angeles, and San Bernardino counties were observed with evidence of desert tortoise predation beneath them (McIntyre 2006).

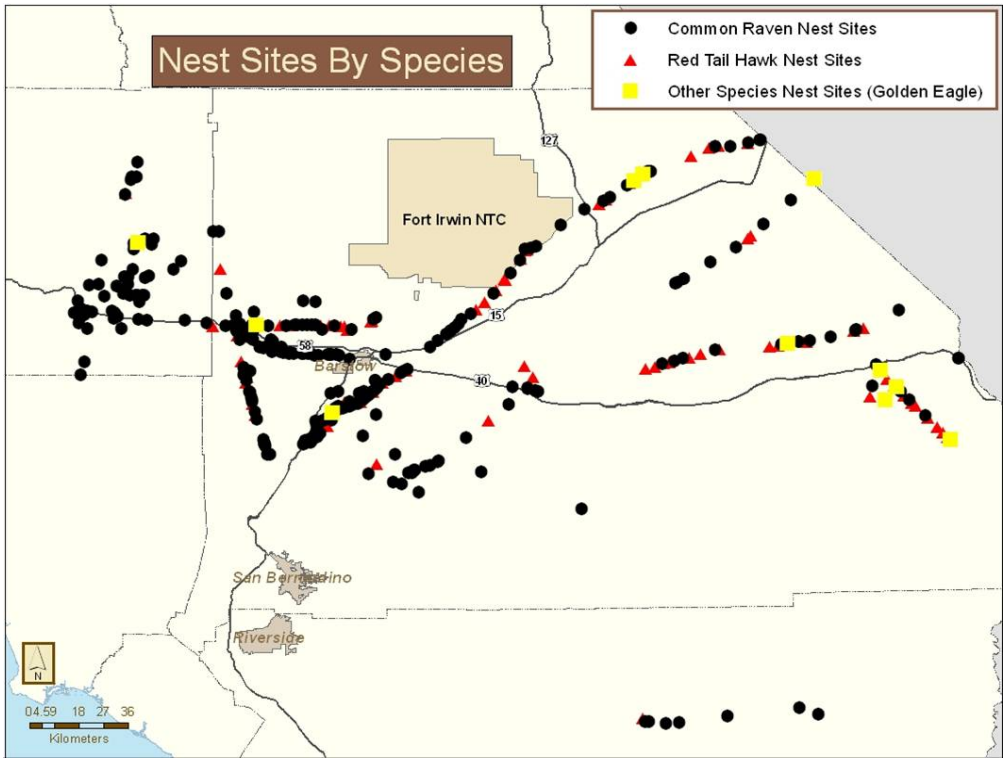

Figure A-5. Nest Sites Observed in 2004 and the Identified Species

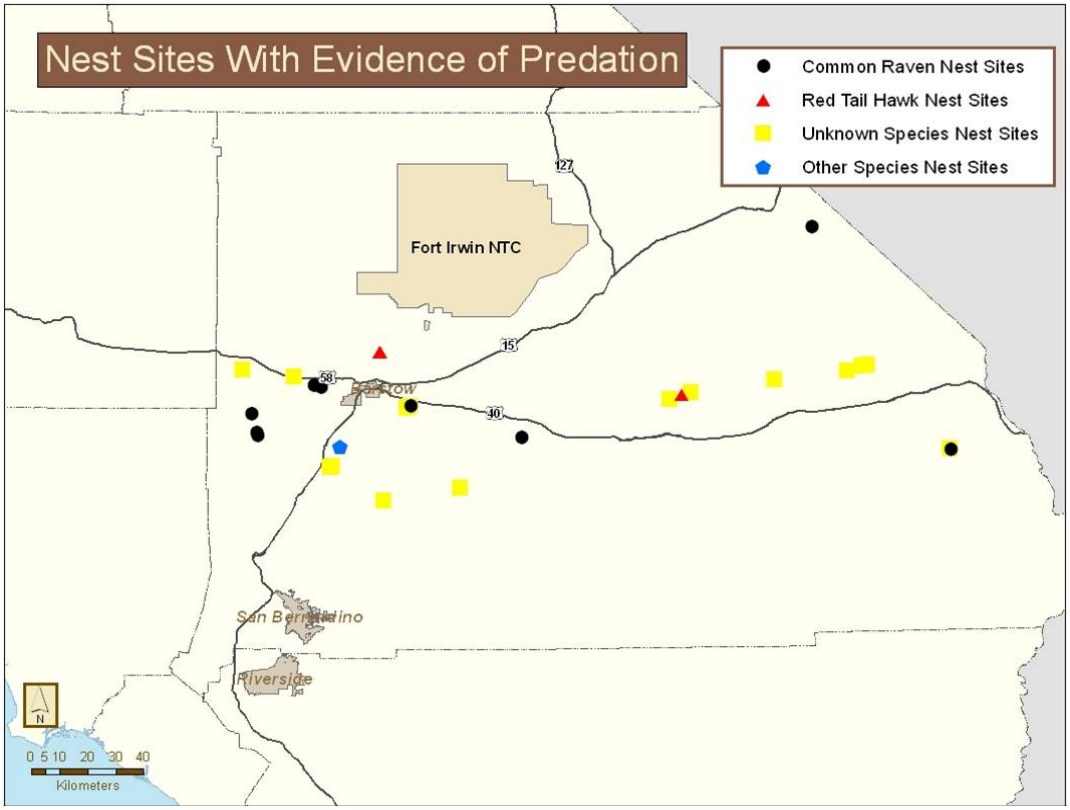

Figure A-6. Locations of Nests Observed in 2004 and Associated Species with Evidence of Desert Tortoise Predation.

APPENDIX B
SUMMARY OF PUBLIC INVOLVEMENT

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1.0 Summary of Public Involvement

The United States and Fish and Wildlife Service (USFWS) followed the *National Environmental Policy Act (NEPA)* and its implementing regulations as developed by the Council on Environmental Quality (CEQ) to encourage public participation in this process. The public involvement and notification process to date are described in the following sections.

1.1 General Process

Various federal and state agencies identified issues related to the proposed action during interagency meetings beginning in 2003.

The USFWS conducted a scoping, or information-gathering phase in which potentially interested groups, individuals, tribes, and agencies were contacted. These individuals and groups included conservation groups, government officials, tribal representatives, and land managers. These entities received letters about the objectives of the action and were asked to respond with any information on methods, concerns, or effects. The scoping effort was also announced to the public through a media release to several newspapers in southern California, including the *Los Angeles Times*, *San Diego Union-Tribune*, *San Bernardino Sun*, *North County Times*, *Desert Sun*, *Victorville Daily Press*, *Desert Dispatch, Daily Independent*, and *Antelope Valley Press*.

The USFWS received comments from 201 entities. Most respondents supported reduction efforts at some level, but some disagreed with the proposed action. The respondents identified various methods to consider in raven management/reduction efforts. These included shooting, removing nests/eggs, implementing an "adopt-a-raven" program, trapping and relocating, establishing a hunting season, implementing aversion training, introducing a predator for the raven, implementing birth control for common ravens, and controlling or reducing the human population and associated development. Some respondents suggested that efforts be directed towards helping the desert tortoise through captive breeding programs, relocation programs, and placing an impenetrable wire ceiling over desert tortoise habitat.

1.2 Tribal Contacts

The USFWS coordinated a separate scoping, or information-gathering effort with the tribes with lands of interest in southeastern California. The USFWS sent letters to 14 tribes and 2 cultural organizations. One response was received from the Agua Caliente Band of Cahuilla Indians. They responded that there was no desert tortoise habitat on their reservation and they did not support nonlethal or lethal management of the common raven.

The Bureau of Indian Affairs (BIA), as the primary trustee safeguarding tribal trust resources, sent letters to 16 tribes in southern California on 2 August 2005. Some of the tribes contacted by BIA were new contacts while many were repeat contacts from the USFWS's earlier effort. The BIA contacted these tribes to inform them of the proposal from the Desert Managers Group to manage the common raven in the California desert to reduce predation on the desert tortoise. The proposed actions would not occur on tribal lands without the tribe's explicit request to implement raven management measures on their reservation. The BIA requested that the tribes respond if they had opposition to the proposal. The BIA received one response from the

Big Pine Reservation. They requested that they be kept informed and sent a copy of the draft NEPA document.

In total, 22 tribes and 2 cultural organizations were contacted by letter during the scoping process.

APPENDIX C
DECISION MODEL

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1.0 DECISION MODEL

Use of a Decision Model for Implementing Removal of the Common Raven. The Decision Model (Slate et al. 1992) is adopted from the United States Department of Agriculture, Animal and Plant health Inspection Service-Wildlife Services (APHIS-WS) decision-making process which is a standardized procedure for evaluating and responding to wildlife damage complaints. The decision model is a description of the thought process used by wildlife specialists, United States Fish and Wildlife Service, and cooperating agencies at each site to develop and implement the most appropriate method to reduce predation by the common raven on the desert tortoise through removal (Figure D-1).

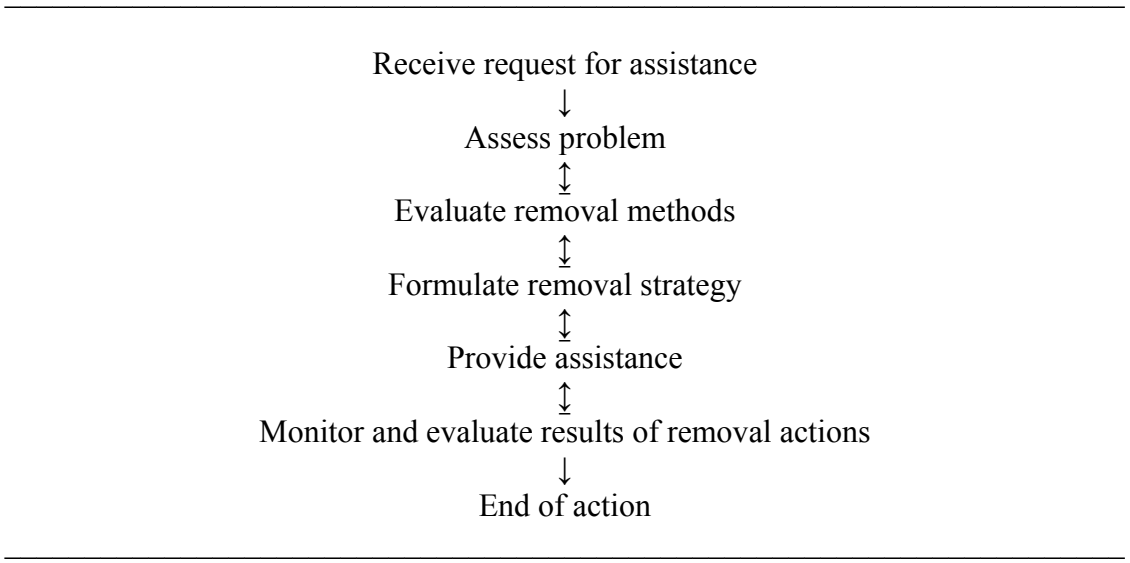

Figure D-1. APHIS-WS Decision Model

Agency personnel would evaluate the appropriateness of methods in context of their availability (legal and administrative) and suitability based on the biological, economic, and social considerations. Following this evaluation, the methods determined to be practical for the situation form the basis of a management strategy. After the management strategy has been implemented, monitoring is conducted and an evaluation of the strategy is conducted to assess its effectiveness.

Alternatives B through D, which include common raven removal, would implement safe and practical methods for the reduction of damage caused by common ravens on the desert tortoise based on local problem analysis, environmental and social factors, and the professional judgment of trained personnel.

In selecting a management technique, consideration would be given to the following:

a. Time of day

b. Time of year

c. Other land uses (e.g., proximity to recreational or residential areas and other structures)

d. Feasibility of implementation of various allowed techniques
e. Movement patterns and life cycle of the common raven for that year
f. Status of nontarget species in the area
g. Local environmental conditions (e.g., terrain, weather, and vegetation)
h. Presence of people
i. Potential legal restrictions
j. Humaneness of the available options, and
k. Cost.

APPENDIX D
RELEVANT LAWS AND AUTHORITIES

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1.0 RELEVANT LAWS AND AUTHORITIES

1.1 Compliance with Major Applicable Federal Laws

Several federal laws regulate wildlife damage management. The federal agencies involved in this action must comply with these laws, as well as consult and cooperate with each other and other agencies, as appropriate. The following federal laws are relevant to the actions considered in this environmental assessment (EA):

a. National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321–4347, Public Law [PL] 91-190)–Environmental documents prepared pursuant to NEPA must be completed before federal actions can be implemented. The NEPA process requires careful evaluation of the need for action, and that federal actions be considered alongside all reasonable alternatives, including the "No Action Alternative." The NEPA also requires that potential impacts on the human environment be considered for each alternative, the alternatives and impacts must be considered by the decision maker(s) prior to implementation, and that the public is to be informed.

This EA has been prepared in compliance with NEPA; the President's Council for Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations Section 1500–1508; and Department of the Interior's Departmental Manual (DM) for NEPA compliance (516 DM 6, 30 AM 2-3); U.S. Fish and Wildlife Service's (USFWS) directive manual 550 FW 1-3 and 505 FW 1-5; Bureau of Land Management's NEPA handbook H-1790-1; and National Park Service's handbook and Director's Order DO-12. It was also reviewed to comply with Department of Defense requirements including Title 32 Code of Federal Regulations (CFR) Part 989 (Air Force), 32 CFR 651 (Army), Marine Corps Order 5090.2a (Environmental Protection), and 32 CFR 775 (SECNAV Instruction 5090.6). The U.S. Marine Corps is regulated under 32 CFR 775.

Pursuant to NEPA and CEQ regulations, this EA documents the analysis of a proposed federal action, and all reasonable alternatives thereto, including the "No Action" or Status Quo alternative. The EA evaluates impacts anticipated from all alternatives, informs decision-makers and the public, and serves as a decision-aiding mechanism. The EA was prepared using an interdisciplinary approach to address all aspects of the natural and social sciences relevant to the potential impacts of the action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

b. Animal Damage Control Act of March 2, 1931, as amended (46 Statute [Stat.] 1486: 7 U.S.C. 426–426c); and Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 (Public Law 100-102, December 1987, Stat. 1329–1331; 7 U.S.C. 426c)–These acts authorize Animal and Plant Health Inspection Service-Wildlife Services, in cooperation with other agencies, to reduce damage caused by wildlife.

c. Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531–1544)–Under the ESA, all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA (Section 2[c]). Section 7 consultations with the USFWS are conducted to use the expertise of the USFWS to ensure that "any action authorized, funded, or carried out by such an agency...is not likely to jeopardize the

continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species…which is determined to be critical…." "(E)ach agency shall use the best scientific and commercial data available." (Section 7[a][2]).

c. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended (7 U.S.C. 136 et seq.; 86 Stat. 975)–This proposal includes the use of the avicide DRC-1339, which is only available for use by certified Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS) personnel. The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The United States Environmental Protection Agency (U.S. EPA) is responsible for implementing and enforcing the FIFRA. All chemical methods integrated into any selected program as implemented by APHIS-WS or other cooperating agencies must be registered with and regulated by the U.S. EPA and the California Department of Pesticide Regulation and used in compliance with labeling procedures and requirements.

d. Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703–711; 40 Stat. 755), as amended–The MBTA provides USFWS regulatory authority to protect bird species that migrate outside the United States. This law prohibits the "take" or killing of these species by any entity, unless permitted by the USFWS. People can obtain permits to take migratory birds under this law that are causing damage to resources. The Migratory Bird Treaty Reform Act of 2004 was passed to clarify the original intent of the MBTA, the conservation and protection of migratory birds native to North America. It directed USFWS to establish a list of nonnative bird species found in the United States. Species on this list will not receive MBTA protection. The USFWS has prepared and published this list in the *Federal Register*.

e. National Historic Preservation Act (NHPA) of 1966, as amended (U.S.C. 470 *et seq*.)–The NHPA requires federal agencies to: 1) evaluate the effects of any federal undertaking on cultural resources; 2) consult with the State Historic Preservation Office (SHPO) regarding the value and management of specific cultural, archaeological, and historic resources; and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural resources in areas of these federal undertakings.

f. Sikes Act Improvement Act of 1997, as amended–The Sikes Act requires the Department of Defense to manage the natural resources of each of its military reservations within the United States and to provide sustained, multiple use of those resources. To meet these goals, the act requires Integrated Natural Resource Management Plans be prepared for military installations. These plans must be developed in coordination with the USFWS and appropriate state fish and wildlife agency, and reflect the mutual understanding of the parties concerning conservation, protection, and management of fish and wildlife resources.

g. Wilderness Act of 1964 (16 U.S.C. 1131–1136, 78 Stat. 890, and PL 88-577)–The Wilderness Act established a national wilderness preservation system composed of federally owned areas designated by Congress as wilderness areas. The lands in this system must be managed to leave them unimpaired for future use and enjoyment as wilderness. The purpose of the Wilderness Act is to ensure that an increasing human population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the Unites States and its possessions, leaving no lands designated for preservation and protection in their

natural condition. It is the policy of Congress to secure for present and future generations the benefits of an enduring resource of wilderness.

Each federal agency with wilderness is responsible for administering the wilderness for the purposes for which it was established (e.g., a national park) and in a manner that preserves its wilderness character. With limited exceptions, no commercial enterprise or permanent road is allowed within a wilderness area. Temporary roads, motor vehicles, motorized equipment, landing of aircraft, structures and installations are only allowed for administration of the area. The use of aircraft may be permitted in wilderness areas where their use has already been established. Measures may be taken to control fire, insects, and disease.

h. California Desert Protection Act of 1994 (16 U.S.C. 410)–The California Desert Protection Act established and expanded Death Valley and Joshua Tree National parks and created Mojave National Preserve. Through this law, Congress declared that appropriate public lands in the California desert must be included within the National Park System and the National Wilderness Preservation System. The purpose of these lands is to preserve their scenic, geologic, and wildlife values; perpetuate their significant and diverse ecosystems; protect and interpret ecological and geological features, maintain wilderness resource values; and promote public understanding and appreciation.

i. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order [EO] 12898)–Environmental justice promotes the fair treatment of people of all races, incomes, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should endure a disproportionate share of the negative environmental impacts resulting either directly or indirectly from the activities conducted to execute this country's domestic and foreign policies or programs. Environmental justice has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. All federal activities are evaluated for their impact on the human environment and compliance with EO 12898 to ensure environmental justice. Any methods selected to reduce predation by the common raven on the desert tortoise will be used as selectively and environmentally conscientiously as possible.

j. Protection of Children from Environmental Health and Safety Risks (EO 13045)– Children may suffer disproportionately from environmental health and safety risks, including their developmental physical and mental status for many reasons. Because the USFWS makes it a high priority to identify and assess environmental health and safety risks, the USFWS has considered impacts that the alternatives analyzed in this EA might have on children. Reducing predation by common ravens on the desert tortoise, as proposed in this EA, would only involve legally available and approved management methods in situations or under circumstances where it is highly unlikely that children would have the potential for exposure.

k. Migratory Birds (EO 13186)–Executive Order 13186 directs federal agencies to use their programs and authorities to develop memorandums of understanding with the USFWS outlining how each agency will promote conservation of migratory birds. The common raven is designated as a migratory bird by federal legislation and regulation.

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2.0 AUTHORITIES OF FEDERAL AND STATE AGENCIES IN WILDLIFE DAMAGE MANAGEMENT

a. Federal Management Authorities

1) Department of the Interior–The Department of the Interior (DOI) was established in 1849. Its mission is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to American Indian tribes and our commitments to island communities.

(a) USFWS–The mission of the USFWS is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The primary statutory authorities for the USFWS mission are: 16 U.S.C. 1521 et seq.; Endangered Species Act of 1973, as amended; and 16 U.S.C. 703–712, Migratory Bird Treaty Act (MBTA) of 1918, as amended.

(b) Bureau of Land Management (BLM)–The BLM manages it lands in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA). The FLPMA directs BLM to follow 13 policies which include: managing lands on the basis of multiple use and sustained yield; managing lands in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; preserving and protecting certain public lands in their natural condition; providing food and habitat for fish, wildlife, and domestic animals; providing for outdoor recreation and human occupancy; and developing plans for the protection of public land areas of environmental concern.

The California Desert Conservation Area (CDCA) Plan of 1980, as amended, is BLM's planning document to manage BLM lands within the CDCA or southern California desert area. The CDCA Plan has been amended with bioregional plans, whose boundaries were generally established to correspond to the recovery units of the 1994 desert tortoise recovery plan. The bioregional plans are: 1) the Northern and Eastern Colorado Desert Coordinated Management Plan, 2) the Northern and Eastern Mojave Desert Management Plan, 3) the Coachella Valley Plan, 4) the Western Colorado Desert Management Plan, and 5) the West Mojave Plan. Most of these planning documents address the need for control of predation by common ravens on the desert tortoise. All alternatives presented in this document comply with these regulations and management plans.

(c) National Park Service (NPS)–All units managed by the NPS are managed in accordance with the Organic Act of 1916, 16 U.S.C. 1. This law states that the primary purpose of park units is: "...to conserve the scenery and the natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." In the 1970 General Authorities Act, Congress amended the Organic Act to clarify that all units, regardless of their specific designation, are to be managed under the Organic Act mandate. In 1978, Congress amended the General Authorities Act in the Redwood National Park Act to further clarify the importance of park resources system wide: "The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in

derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided for by Congress." In addition to the purpose of national parks as outlined in the NPS's Organic Act, as amended, specific purposes may also be provided in establishing or enabling legislation for each park unit and specific legislation for each NPS unit. Death Valley National Park, Joshua Tree National Park, and Mojave National Preserve must be managed in accordance with the California Desert Protection Act, PL 103-433 (1994). Actions within Death Valley National Park, Joshua Tree National Park, and Mojave National Preserve must comply with the general management plan for each park unit. The Death Valley National Park and Mojave National Preserve General Management Plans were completed in 2002; the Joshua Tree National Park General Management Plan was completed in 1994 and amended in 2000. All alternatives presented in this document comply with these regulations and management plans.

2) Department of Defense (DOD)–The DOD has the mission of protecting the national security of the United States and providing the military forces needed to deter war. The installations cooperating in this EA each have different missions, but all work together to achieve the overall mission of the DOD. Combined, the four installations manage nearly 2 million acres in the Mojave Desert.

(a) Edwards Air Force Base (AFB)–Edwards AFB is located in the Antelope Valley in the western Mojave Desert of California. The base manages 301,000 acres in a three-county area in Los Angeles, Kern, and San Bernardino counties. Approximately 11,000 military and civilian personnel work on Edwards AFB to support the mission of the Air Force Flight Test Center (AFFTC). The AFFTC is the Air Force Materiel Command center of excellence for conducting and supporting research, development, testing, and evaluation of aerospace systems from concept to combat. Test forces at Edwards AFB have played a role in the development of virtually every aircraft to enter the Air Force inventory since World War II. With the center's capability of just-in-time testing, Edwards AFB can provide real-time solutions during combat operations. This combat support establishes the AFFTC's direct and tangible link to the warfighter.

Edwards AFB manages its land under Department of Defense Instruction (DoDI) 4715.3, Environmental Conservation Program, May 1996, and Air Force Instruction (AFI) 32-7064, Integrated Natural Resources Management, 22 July 1994. The Integrated Natural Resources Management Plan, Edwards AFB Plan 32-7064, September 2004, is the primary management tool that incorporates additional federal mandates such as the Endangered Species Act of 1973, as amended; Migratory Bird Treaty Act of 1918, as amended; Federal Noxious Weed Act of 1974; Federal Insecticide, Fungicide, and Rodenticide Act; EO 11990, Protection of Wetlands; and EO 13112, Invasive Species. All alternatives presented in this document comply with these regulations and management plans.

(b) National Training Center (NTC) and Ft. Irwin–The NTC, located at Fort Irwin, California, is the only instrumented training facility in the world that is suitable for force-on-force and live-fire training of heavy brigade-sized military forces. The realistic training provided at the NTC assures soldiers are adequately prepared to protect and preserve US interests here and abroad. Each month the NTC provides 4000-5000 soldiers from other installations the essential training opportunities necessary to maintain and improve military readiness and promote national security. The evolving sophistication of military equipment and

advances in technology require a comprehensive battlefield that realistically simulates the tempo, range, and intensity of current and future conflicts. The NTC must provide all the necessary components to achieve world-class training for the U.S. Army. The U.S. Army manages 755,606 acres (1,180 square miles) in the Mojave Desert of California.

The U.S. Army manages all of its installations under the following Army Regulations (AR): AR 200-1, Environmental Protection and Enhancement (February 1997); AR 200-2, Natural Resources–Land, Forests, and Wildlife Management (February 1995); and AR 200-3, Environmental Effects of Army Actions (August 1953). In accordance with the Sikes Act Improvement Act (Fish and Wildlife Conservation and Natural Resources Management Program on Military Reservations), each installation has an Integrated Natural and/or Cultural Resource Management Plan (INRMP/ICRMP). Fort Irwin's INRMP was revised on 15 July 2005 and signed in June 2006 by the USFWS. All alternatives presented in this document comply with these regulations and management plans.

(c) United States Marine Corps (USMC)–The USMC regulations mandate that natural resources under the control of the USMC will be managed to support the military mission, while preserving, protecting, and enhancing these resources. Land use practices and decisions must coincide with the military mission, rely on scientifically sound conservation procedures and techniques, and employ scientific methods and an interdisciplinary approach. Legal requirements by which the USMC abides include: 43 U.S.C. 1701 et seq., Federal Land Policy and Management Act of 1976; 16 U.S.C. 670a–670o , Sikes Act Improvement Act (Fish and Wildlife Conservation and Natural Resources Management Program on Military Reservations); DODI 5000.13, Natural Resources; and Marine Corps Order P5090.2A, Environmental Compliance and Protection Manual. Under Marine Corps Order P5090.2A, stewardship will be recognized as a high priority requirement in retaining control and use of USMC lands for mission needs. The USMC's most relevant plan is the INRMP. All alternatives presented in this document comply with these regulations and management plans.

(d) Marine Corps Air Ground Combat Center (MCAGCC)–The MCAGCC, Twentynine Palms, California, hosts the live-fire Combined Arms training program, which promotes military readiness and allows Marines to coordinate training between forces in the air and on the ground. Artillery, aircraft, armored vehicles, and infantry work together to create a unified force and defend our nation. The MCAGCC manages 596,477 acres (932 square miles) in the Mojave Desert of California. The mission of the MCAGCC, Twentynine Palms, is to develop and conduct the Marine Corps' Combined Arms Training Program and to provide support to the Marine Corps Communication-Electronics School. The following general principles have been identified for MCAGCC:

1) Comply with Federal laws, such as the Sikes Act Improvement Act, Endangered Species Act, Clean Water Act, and Clean Air Act, in such a fashion as to not impede mission activities;

2) Maintain the capability of MCAGCC to support its military mission (Sikes Act) and ensure that lands are continuously available for military training;

3) Manage MCAGCC natural resources consistent with Department of Defense and MCAGCC policies;

4) Participate in regional ecosystem initiatives; and

5) Provide stewardship of public lands.

(e) Marine Corps Logistics Base (MCLB), Barstow–As one of only two logistics bases operated by the USMC, MCLB Barstow is the primary west coast MCLB and Maintenance Center. It is located just east of the city of Barstow and consists of 6,165 acres in the west Mojave Desert. It has two missions: to procure, maintain, store, and issue all classes of supplies and equipment; and to repair and rebuild Marine Corps-owned and other DOD equipment. The MCLB furnishes supplies for the Marine Corps facilities worldwide and is a direct support provider for all installations. The MCLB is also responsible for assuring the technical training of Marines, developing and maintaining their skills, and job efficiency.

All alternatives presented in this document comply with these regulations and management plans as directed by Marine Corps Order MCO5090.2A and the Sikes Act Improvement Act of 1977. The Base Master Plan is also under revision with an expected completion date of September 2006. In all documents, the alternatives presented will comply with the military and civilian regulations and management plans.

3) Department of Agriculture–The United States Department of Agriculture (USDA) was established in 1862. Its mission areas include farm and foreign agricultural services; food, nutrition, and consumer services; food safety; marketing and regulatory programs; natural resources and the environment; research, education, and economics; and rural development.

4) USDA, APHIS-WS–The APHIS-WS is a federal agency authorized by Congress to protect American resources and human health and safety from damage caused by wildlife. The APHIS-WS provides federal leadership and expertise to resolve wildlife conflicts effectively and humanely, using state-of-the-art science and technology. The primary statutory authorities for the APHIS-WS program are the Animal Damage Control Act, which authorized APHIS-WS to reduce damage caused by wildlife in cooperation with other agencies (Animal Damage Control Act of March 2, 1931, as amended [46 Stat. 1486; 7 U.S.C. 426–426c]); and the Rural Development, Agriculture and Related Agencies Appropriations Act of 1988 (PL 100-102, Dec. 22, 1987; Stat. 1329-1331; 7 U.S.C. 426c). The APHIS-WS is a program within the USDA's Animal and Plant Health Inspection Service. It does not manage any land resources. All alternatives presented in this document comply with these regulations and management plans.

b. State Management Authorities

1) California Department of Fish and Game (CDFG)–The CDFG is the state agency with the statutory and common law responsibilities for fish and wildlife resources and habitats. California's fish and wildlife resources, including their habitats, are held in trust for the people of California by CDFG (Fish and Game Code Section 711.7). The CDFG has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitats necessary for biologically sustainable populations of those species (Fish and Game Code Section 1802). The CDFG's fish and wildlife management functions are implemented through its administration and enforcement of the Fish and Game Code (Fish and Game Code Section 702). The CDFG is a

trustee agency for fish and wildlife under the California Environmental Quality Act (see CEQA Guidelines, 14 California Code of Regulations, Section 15386[a]). The CDFG is entrusted to protect threatened and endangered species under the California Endangered Species Act (Fish and Game Code Sections 2050–2115.5).

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3.0 PROJECT BACKGROUND AND PREVIOUS PLANNING

The USFWS has worked to recover and conserve the desert tortoise since it was listed in 1989. These efforts include working cooperatively with numerous federal, state, and local agencies with management or regulatory responsibilities in the California desert. Examples of some of these efforts include population surveys, land acquisition, modification of land management plans, designation of critical habitat, development of a recovery plan, and reduction in or consolidation of activities that result in human disturbance to desert tortoise habitat.

In 1989, a multiagency pilot raven control program was initiated by the BLM, USFWS, CDFG, California Department of Parks and Recreation, USMC, and Animal Damage Control (now Wildlife Services) of the USDA (BLM 1989, Rado 1993). The purpose of the pilot program was to reduce raven predation on hatchling and juvenile desert tortoises and gain information necessary to design a long-term raven control program. The BLM prepared an EA to implement the pilot program at two regions: one in the western Mojave Desert from China Lake Naval Air Weapons Station south to Victorville, west to the El Paso Mountains, and east to Barstow; and the second in the eastern Mojave Desert from north and west of Needles south into the Chemehuevi area (BLM 1989). The EA estimated that 500 common ravens would be removed in 1 year. The pilot program consisted of shooting and selective use of the toxicant DRC-1339 in hard-boiled eggs to remove ravens (Rado 1993). An estimated 100 to 110 individual ravens were killed over a 4-day period at the MCAGCC landfill form May 19 through 25, 1989. Eighteen of these birds were shot while the remaining birds were treated with toxicants. In addition, 6 to 10 ravens were treated with toxicants in a 1-day effort on May 24, 1989, at the Desert Tortoise Natural Area (DTNA). The pilot program was halted on May 24, 1989, by a Temporary Restraining Order. The request to halt the pilot program was initiated by the Humane Society of the United States (HSUS) (*HSUS* v. *Manuel Lujan et al*. 1989).[1] The Humane Society's primary concerns were that birds not responsible for preying on desert tortoises would be killed, other species of animals could be harmed by ingesting the avicide, and insufficient data were presented to justify the control efforts. The lawsuit was subsequently settled out of court, but the pilot program was not resumed.

In 1990, as a followup to the aborted pilot program, the BLM and several partner agencies drafted and distributed for public review a Raven Management Plan (BLM 1990b) that proposed a long-term strategy for reducing common raven predation on desert tortoises throughout the CDCA. This Raven Management Plan was presented in an Environmental Impact Statement (EIS) for the Management of the Common Raven in the California Desert Conservation Area (BLM 1990a). The decision to prepare an EIS was based on the regional scope of the project, the long-term duration of the project actions, and the controversial aspect of using lethal forms of raven control. Twenty-six polygons for implementing raven management were identified throughout the CDCA. The Raven Management Plan incorporated basic principles of Integrated Pest Management (Council for Agricultural Science and Technology 1982) as they apply to vertebrate pests (Timm 1984). These include: lethal control with toxicants and shooting; nonlethal control such as nest destruction, hazing, sterilization, and removal of road kills; habitat management such as changing landfill operation methods and altering perch/nest sites; research

[1] *Humane Society of the United States* v. *Manuel Lujan, et al.*, Civil Action 89-1523 (RCL), D.D.C., Settlement Agreement filed June 29, 1989.

into pertinent aspects of common raven and desert tortoise behavior and ecology; and monitoring common raven and desert tortoise populations. Several concerns, including the need to collect additional data on common raven ecology and behavior, explore and adopt effective nonlethal means of raven control, and monitor both common raven and desert tortoise populations, were raised by various groups and individuals during the public comment period.

In response to public concerns, BLM convened a Technical Review Team (TRT) composed mainly of professional, nongovernment biologists, and conservation policy specialists. The TRT members were from the following organizations: HSUS; Natural Resources Defense Council; National Audubon Society; Defenders of Wildlife; Desert Tortoise Council; Washington State Department of Natural Resources; Desert Tortoise Preserve Committee; Southern California Edison; and Dr. Ed Hill, USDA/APHIS-WS. The TRT supported an experimental approach that focused on shooting individual ravens known to prey on desert tortoises and removing all ravens that were foraging within the DTNA. The intent of this effort was to determine the efficacy of shooting rather than using toxicants as a control measure, and to assess the likelihood that removing only known offending birds rather than all birds in a specific area would aid desert tortoise recruitment. The TRT also recommended that research be conducted to address various aspects of raven ecology and management to develop a more focused and effective raven management program.

In 1993 and 1994, the BLM followed the recommendations of the TRT and implemented an experimental common raven removal program. The two primary objectives of the program were: 1) remove ravens known to prey on desert tortoises (identified if three or more desert tortoise shells showing evidence of raven predation were found within their territories); and 2) remove all ravens that were likely foraging within the DTNA. The program was delayed by an appeal, filed on April 27, 1993, with the Interior Board of Land Appeals by the HSUS. The HSUS objected to the removal of ravens with chicks on the nest without evidence that those ravens were eating desert tortoises. The appeal was withdrawn after BLM agreed to only shoot birds if desert tortoise shells were found within their presumed territories. Shooting commenced on May 13, 1993; 49 ravens were subsequently shot and 10 nestlings euthanized during 1993 and 1994.

An additional objective of the experimental program was to determine if shooting is effective at removing all birds from foraging within a specific area. The result of the study showed that shooting can be used to remove nesting pairs, but it is often difficult to kill the second member of the pair. Difficulties were also encountered when removing common ravens from a broad targeted area (e.g., DTNA) because these birds would often forage in flocks; and after one bird was shot, the rest quickly scattered.

APPENDIX E
LAND MANAGEMENT AND PLANNING DOCUMENTS

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LAND MANAGEMENT AND PLANNING DOCUMENTS

Bureau of Land Management (BLM) Land Management Plans for the California Desert Conservation Area–The BLM uses the California Desert Conservation Area (CDCA) Plan and Amendments to guide management on the lands it administers. Any decisions made because of this Environmental Assessment (EA) process will be consistent with the guidance in the CDCA Plan and Amendments and the *Federal Land Policy and Management Act of 1976*.

Death Valley National Park General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the National Park Service within Death Valley National Park.

Joshua Tree National Park General Management Plan–The subject plan was completed in 1994 and amended in 2000. The amended document, Record of Decision Final General Management Plan Amendment Environmental Impact Statement (EIS)/Backcountry and Wilderness Management Plan, guides the management of lands administered by the National Park Service within Joshua Tree National Park.

Mojave National Preserve General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the National Park Service within the Mojave National Preserve.

Programmatic Environmental Impact Statement–Animal and Plant Health Inspection Service-Wildlife Services (APHIS-WS), formerly called Animal Damage Control (ADC), issued a Final EIS on the national APHIS-WS program (USDA 1997, revised). This EIS addressed an ongoing program of wildlife damage management. Information in the Final EIS that is pertinent to the alternatives in this EA has been incorporated by reference.

Master Memorandum of Understanding (MOU) between APHIS and BLM–This MOU specifies that all programs for animal damage management on lands administered by BLM will be coordinated with appropriate state and federal agencies prior to implementation. The APHIS-WS will develop and update work plans for animal damage management annually in cooperation with the BLM and other appropriate agencies. The APHIS-WS and BLM will identify restrictions for human safety or other mitigation that should be implemented to comply with the BLM's existing Land Management Plans.

Integrated Natural Resources Management Plans–Each of the six military installations within the California desert (Naval Air Weapons Station China Lake, Air Force Flight Test Center at Edwards Air Force Base, National Training Center at Fort Irwin, Marine Corps Logistics Base Barstow, Marine Corps Air Ground Combat Center Twentynine Palms, and Chocolate Mountains Aerial Gunnery Range) is required to maintain and implement an Integrated Natural Resources Management Plan (INRMP).

The purpose of each INRMP is to develop and follow a prescribed planning process for the management of natural resources on each installation. Development and implementation of the INRMP must support military mission readiness by ensuring lands and airspace are available for sustained use. This process meets statutory requirements under the *Sikes Act Improvement Act*

(SAIA), Public Law 105-85, Div. B Title XXIX, Nov. 18, 1997, 111 Stat 2017-2019, 2020-2033. This Act requires the Secretaries of the Army, Air Force, and Navy to prepare and implement INRMPs for each military installation, unless exempted due to the absence of significant natural resources.

Each installation coordinates with the USFWS and the California Department of Fish and Game (CDFG) to ensure that each INRMP reflects the mutual agreement of these parties on conserving, protecting, and managing natural resources on each installation. In addition, as required by the SAIA, the INRMPs are provided for public comment.

County General Plans–California state law requires each county to prepare and adopt a comprehensive and long-range general plan for its physical development (Government Code Section 65300). A comprehensive general plan provides each county with a consistent framework for land use decision-making. Traditionally, the general plan has been organized as a collection of elements or subject categories such as land use, housing, conservation, noise, circulation, open space, and safety. The conservation element addresses the conservation, development, and use of natural resources including water, forests, soils, rivers, and mineral deposits. The open-space element details plans and measures for preserving open space for natural resources, the managed production of resources, outdoor recreation, public health and safety, and the identification of intensive agriculture and irrigated pasturelands. For the California desert there, are five counties each with a county general plan for these elements. These plans are: Imperial County General Plan, Inyo County General Plan, Kern County General Plan, Los Angeles County General Plan (Antelope Valley), Riverside County General Plan, and San Bernardino County General Plan.

APPENDIX F
PUBLIC COMMENTS RECEIVED AND RESPONSES

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